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AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

ISSUED WEEKLY BY THE AMERICAN MACHINIST PRESS,

Vol. 22. 218 WILLIAM STREET, NEW YORK. No. 48.

Contents and Index to Advertisers, Page 12

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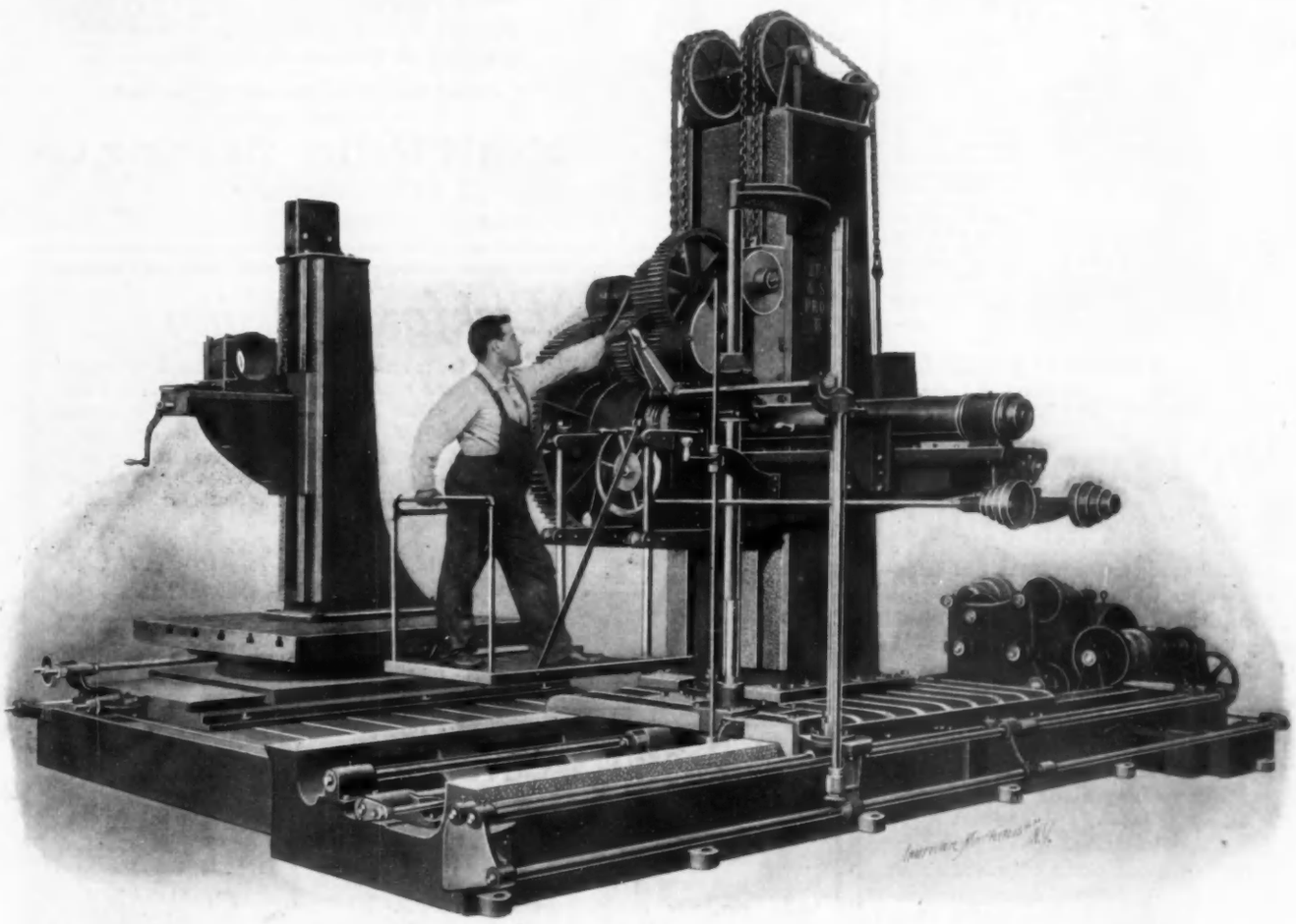
Drilling, Boring, Tapping and Milling Machine

Spindle eight inches diameter. Power quick and slow movement for right hand column and head.



We are prepared to furnish similar machines of various sizes.

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Beaman & Smith,

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is the Planer that Whitney makes. This Planer—the P-4 Planer—is built to turn out the highest grade of wood work that it's possible to make, and to do it rapidly. One of its peculiarities is that it will plane stuff less than three inches long without clipping the ends. We don't know another planer that will do that, and we know all the good ones.

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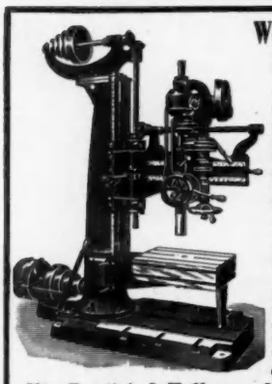

We Have Good Reasons

for believing this to be the best Radial Drill in the world. They're reasons that have ledothers to believe as we believe,and we should be glad to present them for your consideration in the form of an illustrated circular, if you will favor us with your address.

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on making a good lathe—the best lathe—then—after we had crowded every good point that 53 years of machine tool building has brought us, into that lathe—and not till then, did we consider the cost.

We figured on the cost of building that lathe in the best possible manner—on putting into it the very best of materials and workmanship that money could buy—and, after adding a fair profit, produced a lathe that is easily the best at a price that is very low indeed for such a product.

We call it our No. 2 Improved Cabinet Turret Lathe, but its many users have another name for it—they call it "Best." We'll gladly tell you who they are, if you care to know.

American Tool & Machine Co.,
MANUFACTURERS OF SUGAR MACHINERY.
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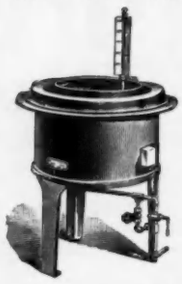
For Tempering Steel Work IN OIL OR TALLOW,

no coal heated furnace ever made will bring such results as our Oil Tempering Furnaces, one size of which (No. 3) is here illustrated.



In this Furnace the heat is evenly distributed, penetrating the bath from all sides, and the temperature is under perfect control at all times. No flame can escape from the combustion chamber to ignite the oil or fumes arising from it, and the temperature of the oil can be raised to an exceptionally high degree without risk of flashing.

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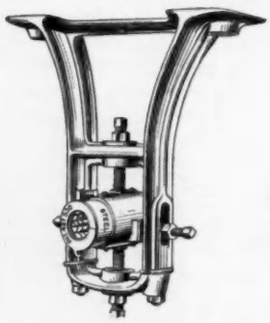

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Jones' friends laughed when he put in Hyatt Roller Bearings, but Jones laughed at the end of the year.

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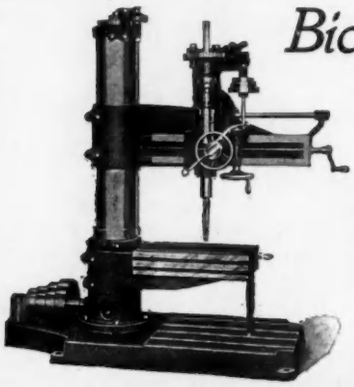

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A good ball bearing is a bearing in which each ball is just exactly the same size as every other ball — perfectly round, perfectly smooth, highly polished and of just the right degree of hardness and toughness.

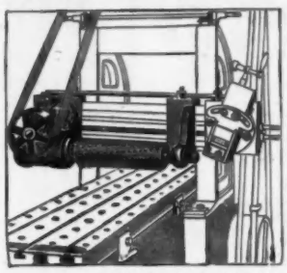
We make large Balls for the bearings of heavy machinery, and every ball we sell has these qualities. We have a system of testing which makes it practically impossible for anything but a perfect ball to get through, and you're safe when you buy balls of us.

Ask for list No. 3.

CLEVELAND BALL & SCREW COMPANY,

446 Arcade, CLEVELAND, O., U. S. A.

MILLING MACHINE



combined with any **Iron Planer** swivels from Horizontal to Vertical.

Do not plane surfaces that should be milled or mill surfaces that should be planed.

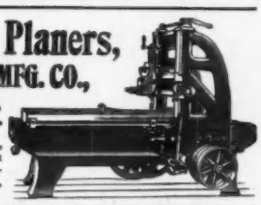
SEND FOR CATALOG.

The Adams Company, Dubuque, Ia.

Whitcomb Planers,

WHITCOMB MFG. CO.,

WORCESTER, MASS.



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Milling Machines.
Boring Machines.
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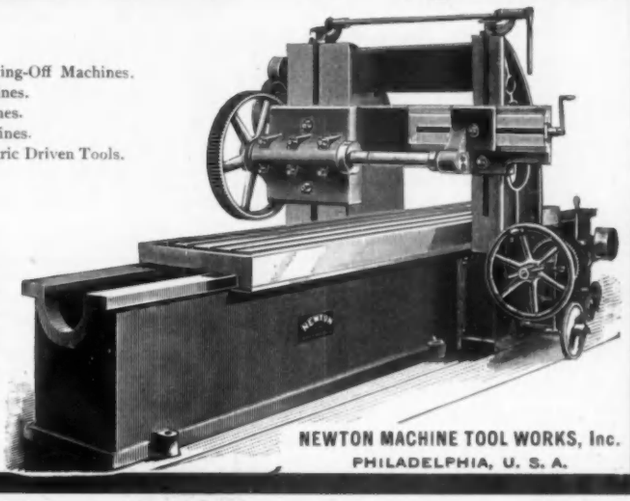

Eight sizes plain milling machines 15 in. x 15 in. to 72 in. x 72 in., any desired length of carriage.

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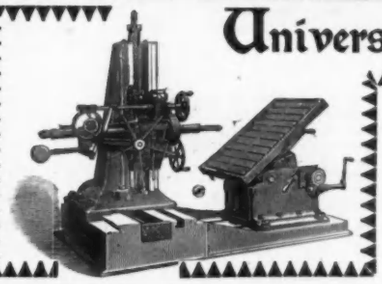
PHILADELPHIA, U. S. A.

Universal Horizontal Drill.



Five sides of a cube can be drilled at any angle without re-chucking the work.

Write

Detrick & Harvey Machine Co.,

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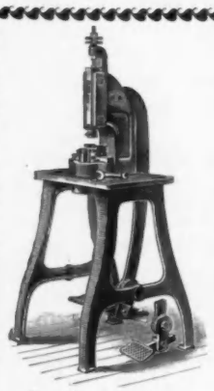

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Wire Drawing Machinery.

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NEW YORK OFFICE, 126 Liberty St.

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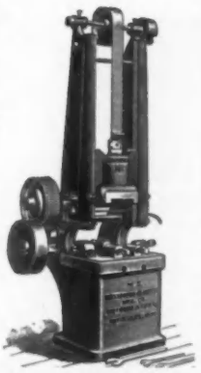

No. 5. Auto. Drop Press.

Index to Advertisers.

	PAGE
Acme Machinery Co	16 and 47
Acme Malleable Iron Works	15
Adams Co., The	11
Aibro-Clem Elevator Co	44
Almond, T. R	42
American Gas Furnace Co	2
American Saw Co	10
American Tool & Machine Co	2
American Tool Works Co	45
Armstrong Bros. Tool Co	55
Arthur Co., The	8
Backus Water Motor Co	54
Baird Machinery Co., U	3
Baird & Co., Henry Carey	41
Baker Brothers	3
Baldwin, Davidson & Wight	39
Ball Bearing Co	16
Barker & Chard Mach. Tool Co	8
Barnes & Co., W. F. & John	42
Bausch & Harris Mach. Tool Co	48
Beaman & Smith	1
Becker-Brainard Milling Mach. Co	46
Bement, Miles & Co	10
Besly & Co., Chas	56
Bethlehem Foundry & Machine Co	8
Bethlehem Steel Co	55
Betts Machine Co	5
Bickford Drill & Tool Co	2
Bignall & Keeler Mfg. Co	15
Bilgram, Hugo	9
Bliss Co., E. W	6
Boston Gear Works	55
Bradford Mill Co., The	53
Bristol Co	56
Brown Hoisting & Conveying Mach. Co	55
Brown & Co., R. H	9
Brown & Sharpe Mfg. Co	56
Buffalo Forge Co	56
Builders' Iron Foundry	4
Bullard Machine Tool Co	44
Bullock Electric Mfg. Co	41
Burt Mfg. Co	38
Caldwell Co., W. E	54
Carborundum Co., The	40
Card Mfg. Co., S. W	7
Case Mfg. Co	44
Cataract Tool & Optical Co	16
C & C Electric Co	3
Chandler & Taylor Co	54
Chisholm & Moore Mfg. Co	43
Cincinnati Mach. Tool Co	42
Cincinnati Milling Machine Co	45
Cincinnati Radial Drill Co	5
Cincinnati Shaper Co	16
Clark, Jr., & Co., Jas. R	7
Clark Thread Co	15
Cleveland Ball & Screw Co	2
Cleveland Gear Works	38
Cleveland Twist Drill Co	56
Clough, R. M	38 and 41
Coffin & Leighton	49
Columbus Machine Co	54
Cook Co., Asa S	9
Cornell Machine Co	54
Crescent Steel Co	7
Crosby Steam Gage & Valve Co	7
Cumberland Iron & Steel Shafting Co	7
Curtis & Co., Mfg. Co	42
Curtis & Curtis	4
Cushman Chuck Co	9
Dallett & Co., Thomas H	8
Danielson Machine & Tool Co	15
Davis Machine Co., W. P	16
Dayton Globe Iron Works Co	54
Detrick & Harvey Machine Co	11
Detroit Lubricator Co	54
Dixon Crucible Co., Joseph	49
Doan & Co., J. B	14
Draper Machine Tool Co	51
Dreses, Mueller & Co	8
Dwight Slate Machine Co	44
Eames Co., G. T	51
Eddy Electric Mfg. Co	48
Engineering Agency	38
Errington, F. A	9
Falkenau, A	4
Faneuil Watch Tool Co	56
Farrel Foundry & Machine Co	50
Fellows Gear Shaper Co	10
Ferracute Machine Co	6
Fifield Tool Co	56
Flather & Co	16
Foos Gas Engine Co	54
Fosdick & Holloway Mach. Tool Co	2
Frick Co	54
Garvin Machine Co., The	40
General Electric Co., The	55
Geometric Drill Co	9
Gisholt Machine Co	3
Gleason Tool Co	56
Goodell-Pratt Co	3
Goodyear, S. W	4
Gould & Eberhardt	16
Grant Gear Works	16
Grant Mfg. Co	15
Gray Co., G. A	16
Hamilton Machine Tool Co	55
Hammacher, Schlemmer & Co	39
Hampden Corundum Wheel Co	4
Hartford Steam Boiler Insp. & Ins. Co	15
Hart Mfg. Co	44
Heald & Son, L .S	43
Henderer's Sons, A. L	49
Hendey Mach. Co	13
Hill, Clarke & Co	14
Hoefer Mfg. Co	4
Hoggson & Pettis Mfg. Co	9
Horsburgh & Scott	56
Horton & Son Co., E	9
Howard Iron Works	55
Hurlbut-Rogers Machine Co	9
Hyatt Roller Bearing Co	2
Ingersoll-Sergeant Drill Co	49
International Correspondence Schools	49
Jenkins Brothers	39
Jones & Lamson Machine Co	16
Kelly Machine Co., R. A	6
Kempsmith Machine Tool Co	4
Keuffel & Esser Co	8
Landis Tool Co	43
Le Blond Machine Tool Co., R. K	56
Le Count, Wm. G	9
Leighton & Wisner	39
Leland & Faulconer Mfg. Co	4
Lodge & Shipley Machine Tool Co	52
Long & Allstatter Co	51
Lunkenheimer Co., The	41
McCabe, J. J	14 and 49
Mackey Co., Ltd., The	11
Mackay, James T	14
Marshall & Huschart Mach. Co	14
Mietz & Weiss	54
Morse Twist Drill & Mach. Co	15
Morse, Williams & Co	7
Morton Mfg. Co	53
Moseley Lathe Co	16
Mossberg & Granville Mfg. Co	11
Mussey Stone Co	38
National Elastic Nut Co	43
Newark Machine Tool Works	16
New Era Iron Works	54
New Haven Mfg. Co	10
New Jersey Machine Works	41
New Process Raw Hide Co	3
New Process Twist Drill Co	7
Newton Machine Tool Works, Inc	11
Nicholson File Co	39
Nicholson & Co., W. H	42
Niles Tool Works Co., Hamilton	52
Niles Tool Works Co., New York	14
Northern Engineering Works	54
Norton Emery Wheel Co	49
Norwood Bicycle Co	41
Oesterlein Machine Co., The	16
Oster Mfg. Co	15
Palmer Bros	54
Patterson Tool & Supply Co	6
Pearson Machine Co	4
Phelps, H. D	44
Philadelphia Book Co	3
Pierce Engine Co	54
Pond Machine Tool Co	43
Pond Machine Co., L. W	52
Potter & Johnston Co	8
Pratt Chuck Co	9
Pratt & Whitney Co	53
Prentiss Tool & Supply Co	14
Putnam Machine Works	16
Q & C Co	10
Quint, A. D	15
Reeves Pulley Co	49
Reinecker, J. E	50
Reliance Mach. & Tool Co	15
Rogers Boat, Gage & Drill Works, John	53
Rue Mfg. Co	41
Safety Emery Wheel Co	41
Saunders' Sons, D	42
Sawyer Tool Co	49
Schwerdtle & Siebert	9
Sebastian Lathe Co	4
Sellers & Co., Inc., William	16
Seneca Falls Mfg. Co	4
Shonberg, I	54
Shultz Belting Co	16
Sibley & Ware	49
Skinner Chuck Co	9
Slocomb & Co., J. T	44
Snyder, J. E	7
Smith & Mills	15
Spencer Auto. Mach. Screw Co	7
Springfield Foundry Co	6
Springfield Gas Engine Co	54
Springfield Separator Co	49
Standard Tool Co	41
Starrett Co., L. S	10
Steel Ball Co	7
Stuart's Foundry & Machine Works, R. J.	56
Tabor Mfg. Co	54
Tight Joint Co	8
Toomey, Frank	14
Trump Brothers' Machine Co	9
Turner, Vaughn & Taylor Co	55
Vitrified Wheel Co	44
Warner & Swasey	56
Watson-Stillman Co., The	42
Weber Gas & Gasoline Engine Co	54
Webster Mfg. Co	54
Wells Bros. & Co	56
Westcott Chuck Co	9
Westmacott, J. M	55
Whitcomb Mfg. Co	11
Whitney, Baxter D	2
Whitney Mfg. Co	51
Whiton Machine Co., D. E	9
Wiley & Russell Mfg. Co	39
Wiley & Sons, John	39
Williams & Co., J. H	38
Windsor Machine Co	4
Winkley, F. D	16
Wood's Sons, T. B	43
Woodward & Powell Planer Co	39
Woodward & Rogers	42
Worcester Machine Screw Co	41
Wyke & Co., J	3
Wyman & Gordon	56
York Co., S. M	14
Young Mfg. Co., W. C	49

Contents.

	PAGE
Temperature Regulation in Shops	17
An Up-to-Date Fable	17
A Famous Gun-Maker	17
Extracts from Chordal's Letters	18
American Machine Shop at Paris Fair	18
A Boiler Blown into the Sea	18
Commercial Review	19
Electrical Circuit Breakers—I. By Wm. Baxter, Jr.	21
Flywheel Effects on Shafting. By W. H. Booth	23
Australian Patent Rights and Wrongs	23
44-Inch Turret Chucking and Turning Lathe	24
The New Atlas Works, Stockholm	26
Trying for a Monopoly	31
Accused of Fraud	31
Letters from Practical Men: The Linotype Machine—What It Does and How It Works. By Morris Fulton. ....A Planer Job—Automatic Feed by a String. By Raunalt F. Keys. ...Bad Arrangement of Forge Piping. By Wm. Sangster....The Future of Iron. By Tecumseh Swift. ...About Drawing Curves. By W. A. Bradley....Repairing the Crank Shaft. By Albert Cone....Punching or Shearing the Lugs of Tie-Plates. By W. M. Wickham.... Cheap and Quick Repairs. By S.	32-36
Questions and Answers	36
Electrical Engineering at the University of Illinois	36
Technical Publications	36
Personal	37
Obituary	37

AMERICAN MACHINIST

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Lieber's and A B C Codes.

Temperature Regulation in Shops.

We are quite sure that in many shops the matter of temperature is not sufficiently attended to nor the importance attached to it that it deserves. We are reminded of this by the recently observed fact that in the shops of the National Cash Register Company they have during the winter months a man whose business it is to observe and regulate the temperature of all the rooms of all the buildings. Thermometers are placed at thermo-strategic points, and these are periodically and systematically observed, so that the heat and admission of fresh air may be controlled in accordance therewith. The National Cash Register people believe that this pays; that is to say, that there is a certain right temperature for each particular room, and that any materially less or greater temperature than this best one reduces the efficiency of all who are at work in that room. We believe it is now quite fully understood among shop owners that uncomfortable shops do not pay, but with the modern appliances for heating shops may be made too warm, and those who work in them may not notice the greatly increased heat, and may feel it in no other way than by drowsiness and lack of energy, which is always produced by excessive heat. This is where the beneficent function of the observed thermometer comes in, and it is undoubtedly best to have someone whose business it is to observe and regulate temperatures, for in this matter, as in other things, it is true that what is everybody's business is nobody's business, and therefore receives no attention whatever.

An Up-to-date Fable.

An Honest and Hard-working Machinist found himself in pecuniary Straits, owing to the dishonesty and rascality of his partner, who was the Business Man. Being possessed of great kindness of Heart, the Honest and Hard-working Machinist did not have the Business Man thrown into Gaol, as he should have done, but allowed him to depart, and in great Distress of Mind sought counsel with certain Sales Agents in a nearby city, who had at divers times acted as Factors for his firm.

These Sales Agents professed great Sympathy for the Honest and Hard-working Machinist in his extremity, and gave him many Smooth words. They also opened their Treasury and Stood off the creditors; exacting only that they should be chosen Officers of the newly-formed Company. Thereupon the Honest and Hard-working Machinist greatly Rejoiced and was Content, saying that he had at last found true and honest Friends, who would prevent him from the Loss of the fruits of all his Labor through many years. But the Sales Agents, in their Power as Officers of the Manufacturing Company, appointed themselves Exclusive Sales Agents of the Company, and were able to fix Prices and Commissions to Suit themselves. They did so, and otherwise conducted themselves in a High-handed and Outrageous manner. Finally, they cast out the Honest and Hard-working Machinist, and, when too late, his Eyes were opened, and he said, "Alas! that I should have fallen a Victim the second time. I now see that it had been better for me had I let the Business go to Destruction and started another Shop for Myself. This I cannot so easily do now, because I am Older and because by the course I have Pursued I have Preserved and Built up a Business for others with which it would be hard for me to Compete."

Moral—The moral of this story is automatic and self-proclaiming.

Debating questions of public policy is not generally considered to be the special forte of machine builders, but we have just heard of an instance in which two of them gained a signal victory over two lawyers who took the opposite side of a question being now much discussed. The debate was held before the Calvary Culture Club, of West New Brighton, Staten Island, N. Y., and the question discussed was "Shall we retain the Philippines and other acquired territory?" Messrs. G. S. Humphrey and Wm. M. Barr, both of whom are connected with the C. W. Hunt Company, took the negative side of the question, and both read carefully prepared papers. Two lawyers, whose names we have not learned, took the other side, and in the debate both sides confined the discussion pretty closely to the Philippines alone. At the close of the debate a vote was taken as to the opinions of the audience on the merits of the question without regard to the debate, this vote being 14 to 34 in favor of retaining the Philippines. But a vote taken on the question as to which side had the best of the debate exactly reversed the figures, the vote being 14 to 34 in favor of Messrs. Barr and Humphrey.

A Famous Gun-Maker.

Mr. Samuel Blakemore Allport, late master of the Birmingham proof-house, who died at Moseley, Birmingham, on October 23, in his seventy-seventh year, was one of the oldest members of the Birmingham gun trade, his apprenticeship to his father dating from 1836. From the age of twenty-one to thirty-two he was engaged as a civil engineer under Brunel, and, among other matters, he had charge and management in the laying down of several sections of the South Wales Railway. In 1858 family circumstances induced him to return to the gun trade and take up his father's business. This he considerably developed during the following thirty-five years, and he rapidly took a leading position in the trade. He was elected a guardian of the Birmingham proof-house in 1869, chairman in 1886, and

proof master in 1892. This last position he held until his death.

The gun trade was much indebted to Mr. Allport for his untiring energy and ability in bringing to a successful issue the problem of the strain set up by modern nitro-powders. Previous to the introduction of these compounds little was known in a scientific way as to what the strain actually was in small arms. Mr. Allport went into the matter thoroughly and scientifically. He found that arms for use in the field for sporting purposes were frequently strained and damaged by the use of newly introduced violent compounds, and, in accordance with a system which he arrived at as the result of long experiment, he manufactured from designs of his own a special weapon called a test gun. This, after long and patient study, led to the development of a new kind of work for "birding" gun-makers. The instrument constructed by Mr. Allport had a series of crusher gages fixed in the barrels at given intervals, and so arranged that copper and lead disks were crushed by the violent impact set up by the ignition of the powders used in them. These required to be accurately measured with a micrometer gage to something like the 1-4,000 of an inch.

After the firing of thousands of experimental shots, the relative strengths of the various nitro-compounds were accurately ascertained. Previous efforts in this direction had been carried out on old-fashioned lines. At the meeting of the British Association in Birmingham in 1886 Mr. Allport read a paper, and also exhibited one of these test guns, and he received the hearty congratulations of several of the most important members of the British Association on thus opening up a new era in scientific gun-making. The guardians of the Birmingham gun trade were also so much impressed with the value of Mr. Allport's work that they took over this special gun, and it is now in constant use at the Birmingham proof-house for testing new powders submitted by experimental chemists. In carrying out the different trials of powders Mr. Allport introduced a special wear chart, by which can be seen at a glance the action and strain set up by violent explosives in gun-barrels. This has been generally adopted by later experts as being the best means of showing how to arrive at the varying strengths of gunpowders. Another useful invention Mr. Allport brought out was a micrometer barrel-testing gage for measuring the internal diameters of gun-barrels, this having previously been done in a very rude and rough way. Patents and improvements in manufacturing sporting small arms, together with numerous machines, are also due to him. One of the latest improvements connected with the Birmingham proof-house, in which Mr. Allport was especially concerned, was the new covered range at Small Heath, especially constructed to render impossible the escape of stray bullets. The design of this range was the result chiefly of his own work.—London "Times," October 31.

Extracts from Chordal's Letters.

Editor American Machinist:

I have taken up Chordal's letters, after a lapse of several years, and find them quite as fresh, vigorous and interesting as when I read them in the "American Machinist." They fit our shops and workmen to-day, even better than when Chordal tramped. To those who have read them these letters would be very interesting, and to the majority of your present readers, who perhaps have not read them, they would come as a blessing and an inspiration. Why not publish them, or part of them, in the "American Machinist?"

HARRIS TABOR.

[The above letter was not written for publication, but the author has consented to our publication of it as a sample of a number of letters we have received suggesting the republication of Chordal's Letters. While we are convinced that many of our readers would appreciate their republication, yet, on the whole, it seems not advisable for us to do this, for several reasons; among others, that the letters are now published in book form, and our publication of them would hardly be fair to the publishers nor to Mr. See, who receives his author's royalty upon the books sold. We are convinced, however, that every man who has anything to do with machine shops should have at hand a copy of Chordal's book. Its cost is $2. It is worth much more than that to anyone who has anything to do with machine construction, and is much better worth its cost and the reading than are very many books that are much more widely known. —Ed.]

American Machine Shop at Paris.

Twenty-seven carloads of structural material were shipped from East Berlin, Conn., by the Berlin Bridge Company on the 15th inst., consigned to the United States Commission, Paris, France. This trainload of material is for the steel framework of a typical American machine shop, to be used exclusively for the American exhibition of iron and wood-working machinery at the Paris Exposition of 1900. The United States Commission will use this material in the erection of a building 343 feet long and 74 feet wide, which will be equipped with power.

A Boiler Blown Into the Sea.

In the reports of the British Board of Trade is one relating to a boiler used to supply steam to a winch on a sailing vessel, and which, as the consequence of an explosion, was lifted from its seat and projected over the side into the sea. One side of the deck house in which the boiler stood was completely wrecked; one man was killed and another seriously injured. The fact that the boiler was projected upward would lead to the inference that the cause of the disaster was a collapse of the firebox, many instances of which have occurred with vertical boilers.

Messrs. Hammacher, Schlemmer & Co., New York, are making what is believed to be an improvement on the time-honored machinists' twisted scriber. They make a neat, round knurled handle with a split chuck at the end, which holds an ordinary sewing needle, the handle being hollow for the insertion of reserve needles. It makes a very neat and convenient scriber, well suited to delicate and fine work.

At a recent meeting of the New York State Association of Railway Surgeons L. L. Gilbert, assistant counsel of the Pennsylvania road, read a paper on "Medico-Legal Features of Physical Fitness," and said that courts of law might in the future regard physically incompetent employees as analogous to imperfect tools or equipment, and that it behooved railways to protect themselves from such possible liability for negligence.

A. Otto Diechmann gives it as his opinion that German machinery dealers have at present in stock in the free ports of Germany about $1,000,000 worth of American machine tools which have been regularly bought and paid for but not yet sold, or at least delivered, to customers.

Mr. Loewe on his return to Berlin was interviewed by the "Tageblatt" and expressed the opinion that America is far ahead of Germany in the use of electricity, and said he was convinced that if Germany does not want to be left far behind in competition for the world's trade, she must make better use of electricity.

In a recent report it is stated that for the three months ending September, the tonnage of steel vessels built on the Clyde alone was just about double that of the whole of the steel ships built in the United States during the same period.

A Chicago newspaper contains an account of the fining of a manufacturing company there for maintaining a nuisance in the way of tumbling machines in which lengths of iron pipe were tumbled. The concern, we understand, is a manufactory of steam fitters' supplies, and the tumbling operation was declared to make life unbearable in the region of the works.

An invitation is to be extended to the members and guests of the American Society of Mechanical Engineers to visit the plant of the American Machinist Press the afternoon of Wednesday, December 6. Here they will see a modern printing plant with motor driven presses, and will have an opportunity of seeing the process of making half-tone plates.

Commercial Review.

NEW YORK, FRIDAY EVENING,
November 24, 1899.

MACHINE TOOLS, ETC.

In some respects there is a little relief from the tension that has long characterized the machine tool market. This is shown in the relative lull of demand, which some, but not all, of the selling houses are reporting, and in the greater facility with which many of the lighter lines of tools can be obtained. Manufacturers are recovering from the shock sustained when they were struck by the boom, and, having increased their facilities, are better able to cope with orders than they were a few months ago. But especially, dealers are reaping a harvest of tools from the seed they sowed on manufacturing ground at the inception of the boom. It is not to be supposed that by any means all of the orders booked by manufacturers this year have been directly from consumers. A large proportion, as was natural, were placed by selling firms. The dealers were generally as hard pressed for the tools by their customers as were the makers by the dealers, and often a block of tools ordered for stock was sold out before delivery; yet to a limited extent the dealers' purchases were of a mildly speculative character. A certain New York selling firm, which has warerooms on Liberty street not more than a mile and a half from Broadway, is said to have placed orders, before or during the boom, for some $600,000 worth of tools. It now has so many machines that it is embarrassed for room in which to store them all. These people seem to be pretty well satisfied with their new acquisitions, though they are criticised as having gone into the matter a little more deeply than was altogether prudent. Probably prices have risen enough since the tools were ordered to give a margin that will insure good average profits, even allowing for a few losses. In another big tool store, on Liberty street also, there is some complaint of difficulty in storing the tools that are on hand at the time being. But it is not the larger tools which are becoming thus plentiful.

Automobile makers are not crowding machine tool builders very hard at present. Indeed, from the standpoint of tool makers, there are signs of a lull. So many have already entered the automobile manufacturing industry that they are not unlikely beginning to get scared at each other, and inclined to go slow. They have the rise and fall of the bicycle before them as an object lesson. It would be a little surprising to know the total number of automobile shops that have sprung up or gone over to that line of work in America. They are somewhere in the hundreds, apparently. A particular tool company secured a list of the names of 150 or 200 of them and sent each one a circular of a machine well adapted for their use. The results of the circulars will hardly balance the cost of printers' ink expended upon them; in fact, it is not known that any replies have been received. All of which suggests some reflections concerning automobiles, and perhaps some concerning methods of advertising.

Among the items of additional expense which machinery manufacturers have to consider this year is that of higher wages, not only by express stipulation, but because of the necessary inefficiency of the many new hands that are taken on. A certain machinery builder, who has largely increased his force, alludes in conversation to this as among the disbursements he must consider in estimating profits. He has no specific complaint at the way things are run in his shop. His foremen are careful about the work they give out to inexperienced hands. Yet the new man must inevitably accomplish less than the old one of equal general merit, since he is not used to the shop; when he wants a particular tool he does not know instinctively where to find it. Therefore, our manufacturer considers that he is paying increased wages upon nominally the old basis.

Prices tend upward still. Sibley & Ware, South Bend, Ind., have made an advance of 10 or 12 per cent. Three of the Worcester manufacturers have been threatening a further increase. The Egan branch of the J. A. Fay & Egan Company, it may be noted in passing, have raised prices on their wood-working machinery about 5 per cent., effected chiefly through a change in discounts.

Some people on the other side of the water have a great deal of difficulty in getting it through their heads that buyers no longer have everything their own way in America. A machinery builder in this section quoted on a machine for English account. It was not a particularly large machine, but was a special one, which would take quite a while to construct, and he was already submerged under orders. In the proposal he did not make any promise as to delivery. Upon receipt of it the English party returned answer: "We accept the offer of the machine for shipment in thirty days."

A firm which makes upright drills was recently about to raise prices, and its export agents gave notice of the fact to their European representatives. Thereupon these representatives in England, France and Hamburg sent in anticipatory orders for as many as thirty-two drill presses.

A man extensively and responsibly engaged in exporting tools to Europe was asked by a representative of the "American Machinist" with which of the three countries, Germany, England or France, that trade seemed to be the most active. "It is hard to form an estimate," he replied. "From the returns of one mail it will seem that one country is buying best, and the next week the orders will come from another. But, on the whole, if I were compelled to express an opinion, I should say that France now shows the most disposition to make up for lost time."

The Watson-Stillman Company continues to be exceedingly busy, the new orders for hydraulic machinery booked more than taking the place of the old ones that are worked off. The company has been slow about advancing prices with the changed conditions of the material market, but within a month past has taken measures necessary to secure a margin on the heavier machinery where material is an important factor of cost. These changes do not apply to the lighter and more numerous machines made by the company.

The English Brush Electric Company, which has works in the neighborhood of London, is having constructed by the Watson-Stillman Company a large hydraulic press, to be used for such work as forcing on armatures. It is capable of exerting a force of 500 tons, the working pressure being 6,000 pounds per square inch, ram 15 inches in diameter, stroke 18 inches, distance between rods about 8½ feet, and rear beam adjustable horizontally along rods about 7 feet. The Watson-Stillman Company is building two medium-sized hydraulic presses for the Westinghouse Electric and Manufacturing Company, Pittsburgh, and one for the Société Industrielle d'Electricité (Westinghouse system), Havre, France, to which other machines as well have been sold.

The New York Air Compressor Company, which has acquired a shop at Arlington, N. J., and is fitting it up, has recently been making purchases of machine tools estimated at $15,000.

The Pratt Chuck Company, Frankfort, N. Y., is receiving a heavy demand for its product; in consequence it has largely increased its force, and is rebuilding and making additions to its plant. Among several foreign orders recently received was an especially large one from a shipbuilding firm on the Clyde. It is looking for a still better export trade, as it is now in correspondence with one of the largest railroad systems of Great Britain, which desires to secure a chuck that will not permit the drill to slip under any conditions, and it is hoped that this will lead to the introduction of the Pratt chuck in the several railroad shops connected with the road. It has already filled a trial order for this company. It is in receipt of numerous inquiries from all parts of Europe, and also reports large increase in its domestic orders.

The Fuller Round Bale Cotton Compress Company, which proposed to erect a plant, to be located, it was thought, in Memphis, Tenn., for the manufacture of cotton and ginning machinery, has not yet issued its specifications for machine tools. These are likely to go over until after the first of the year. The value of machine tools in the contemplated equipment is upwards of $100,000.

The Fifield Tool Company has made a

substantial advance in its prices by changes in discount and list. The revision of the list, however, has been based upon improvements in the machines.

A New York tool dealer has lately returned from a visit to Cincinnati manufactories and reports them as still dominated by great activity. He was much impressed with the new shops in that city and their perfection of equipment, inspection and management. He pronounces very favorably upon them as compared with Eastern shops.

There is reason to think that it will not be very long before the new British Westinghouse Works, Manchester, England, will have their tool equipment ordered, which, it almost goes without saying, will be American. There is a rumor that one of the errands of Mr. Charles Churchill on his late visit to this country was in connection with this equipment. For the heavier tools of the outfit, however, recourse will undoubtedly be had to companies outside of those regularly represented by Charles Churchill & Co., and we are reliably informed that the Niles-Bement-Pond Company has already submitted its proposals.

E. C. Moxham & Co., of this city, are engineers and contractors for the installation of a practically new power house for the Johnstown (Pa.) Passenger Railway. They have ordered two 750 horse-power St. Louis Corliss engines, Westinghouse generators to be run by the same, and 1,200 horse-power of Heine boilers.

AMERICAN ENTERPRISES IN FOREIGN LANDS.

The Dominion Iron and Steel Company is a new American enterprise for the development of mining products at Sydney, Cape Breton, Nova Scotia. One of its prime movers is Mr. H. M. Whitney, of Boston. Orders for material with which to equip the plant—a big open-hearth one—were placed in Pittsburgh with the Riter-Conley Manufacturing Company and others, and shipments are now going forward. Mr. A. J. Moxham, formerly with the Johnson Steel Company, Lorain, Ohio, has been appointed manager.

A Pittsburgh dispatch states that the Pittsburgh Reduction Company has decided to erect a $1,000,000 aluminum plant at the Shawenegan Falls, on the St. Maurice river, in Canada, and that it has contracted with the Westinghouse Electric and Manufacturing Company to furnish 11 generators at the value of $150,000. The reason ascribed to this new move on the part of the Pittsburgh Reduction Company is to care for and extend its large and growing Canadian trade.

We note a report that the Russian Government has made indirect overtures to Mr. Duluth-Smith, of Duluth-Smith, McMillan & Co., Philadelphia, with a view to the erection of a large locomotive works on the Trans-Siberian Railway, and that a rail mill has also been broached. American capital to the amount of $5,000,000 is said to be under private solicitation for the enterprise.

CHICAGO MACHINERY MARKET.

The new cars which the railways have lately been receiving from car builders have sufficiently increased the proportions of repair work to demonstrate that the repair facilities are inadequate to the demands. The condition is now felt appreciably by the machinery trade. But it is just beginning. The movement towards the increased equipment of railway shops is stimulated, also, by the congestion of traffic and the accumulation of disabled rolling stock at the shops. The opinion is expressed that from this source the machinery trade during the next few months will be brisk. The sale of machine tools shows little, if any, decrease from the trade of the past months. In the course of repeated interviews a minor note, indicative of a subsidence, is faintly heard, but it appears to be sympathetic rather than actual. During the past few weeks the opinion has gathered force, probably owing to the weakness of sheets and plates, that the crest of high prices for iron and steel has been reached, and that delays in purchases will be the better policy for the buyer to pursue. This opinion may be without foundation, but that it exists is the report of all factors of these trades. And the attitude of the manufacturer being to defer the purchase of material, machinery may be included within the scope of his policy.

But that the machinery trade is not feeling to any considerable degree an abatement of the very excellent business of the year is evidenced by the tendency of values to increase. No shrinkage of prices is anywhere reported, and slight advances, as compared with a month ago, are common. Neither are deliveries improving to any appreciable extent, though in this respect there is diversity, some shops gaining a little but others falling behind to about the same degree. Planers are scarce and large lathes are likewise hard to procure. The buying is very general in character, few, if any, of the manufacturers being strangers to the business that is current. An occasional equipment of an entire plant is thrown on the market, old machinery being replaced in its entirety by the later and more efficient, but buying generally consisting of modest additions made by existing plants. Fraser & Chalmers, of Chicago, have just bought machinery to the value of about $20 000, paying premiums for quick deliveries. But not a little business is being done for future shipments up to six months or longer. The representative of one large machinery builder notes an increasing number of inquiries from people who, if they buy, will manufacture products in opposition to some of the combinations of producing interests formed during the year. He thinks the future for the machinery trade from this source is quite promising.

E. P. Allis Company is bidding on comparatively little of the business that is now offered. For blowing engines they are filled up well into two years, and are not quoting deliveries under that limit. The Erie City Iron Works are running night and day in their engine department, but do not find night work profitable in the boiler department.

CINCINNATI NOTES.

The Lane & Bodley Company has shipped a 12x22x42-inch cross compound engine to China, and a triple-expansion Corliss type engine to a paper mill in Shanghai, China; a complete saw-mill outfit to New Zealand, and another to Honduras; a 16x24-inch slide-valve engine to Mexico; a Corliss cross compound engine for use in the Indiana gas belt, and a 30x64x36-inch Corliss cross compound for the Allegheny City water works.

The Cincinnati Planer Company has put in a 60 horse-power engine and boiler in place of the gas engine which it has been using, and which is not large enough for its purpose. It has also installed a steam heating and electric plant.

Quotations.

NEW YORK, MONDAY MORNING,
November 27, 1899.

Iron—American Pig, tidewater delivery in 1900:—

Pennsylvania Irons:

No. 1 X foundry	$24 65 @ $26 70
No. 2 X foundry	23 65 @ 24 70
No. 2 plain	22 90 @ 23 70

Alabama Irons:

No. 1 foundry	23 25 @ 23 75
No. 2 foundry	22 25 @ 22 75
No. 3 foundry	21 50 @ 22 00
No. 1 soft	23 25 @ 23 75
No. 2 soft	22 25 @ 22 75
Foundry forge	20 50 @ 20 75

Bar Iron — Base sizes — Refined, mill price on dock 2.25 @ 2.30c.; store price, 2.60c., upward; common from store, 2.50 @ 2.60c.

Tool Steel—Base sizes—Standard quality, 7 @ 8c.; extra grades, 12 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—Ordinary brands from store, 3c. in small lots.

Cold Rolled Steel Shafting—Base sizes—From store, 4 @ 4¼c. in small lots.

Copper—For Lake Superior ingot, 17 @ 17⅛c.; electrolytic, 16¾ @ 17c.; casting copper, 16⅝ @ 16⅞c.

Pig Lead—Carloads, 4.62½ @ 4.65c. for shipment, New York delivery; 4.65 @ 4.70c. for spot; wholesale lots, 4.60c.

Pig Tin—In 5 and 10-ton lots, f. o. b. New York, 27⅝ @ 27¾c.

Spelter—Prime Western, 4.45c. for shipment, New York delivery; 4.55 @ 4.65c. for spot.

Antimony—In cask lots or over, Cookson's, 10.95 @ 11c.; Hallett's, 9¾ @ 9⅞c.

Lard Oil—Prime City, present make, 44 @ 47c. in jobbing lots.

Electrical Circuit Breakers—I.

BY WM. BAXTER, JR.

A circuit breaker is a switch that is so constructed that it will open the circuit automatically when the current reaches the strength at which the device is set to operate. In the strictest sense of the word a safety fuse is a circuit breaker, since it is only a short length of wire so proportioned that it will melt when the current strength reaches the predetermined strength. The name "safety fuse," however, has been applied to the latter device, while circuit breaker is only used to designate magnetically operated switches.

A circuit breaker in its most elementary form is shown in Fig. 1. The coil of the magnet *M* is connected in series in the circuit that is to be protected. The core *C* of this magnet exerts an attractive force upon the end *A* of the lever *L*, and when the current strength rises to a certain point the attraction becomes sufficient to overcome the weight of the end *S*. When this occurs, *A* is drawn against the end of *C* and *S* separates from *N*, thus opening the circuit. If a sliding weight is placed upon the end *S* of the lever, or if in addition to the weight the tension of the spring, pulling downward, has to be overcome, it is evident that by moving the weight further from the fulcrum *B*, or by increasing the tension of the spring, if the latter is used, the resisting force can be increased, and thus the device can be adjusted so that *A* will be drawn against *C* with such strength of current as may be desired. To make the apparatus a circuit breaker it is necessary to provide the catch *t*, for without this it would be simply a current interrupter. As can be readily understood, if there were no catch the lever would drop away from *C* soon after being attracted, for the separation of *S* from *N* would interrupt the current, and therefore the strength of the magnet would die out.

This type of circuit breaker would answer every purpose for currents of very low voltage and amperage, but would not operate successfully with such currents as are used commercially for lighting and power purposes. It would fail, first, because the contact between *S* and *N* is not perfect enough to prevent overheating, and, secondly, because the width of the separation would not be sufficient to prevent the current from continuing to flow across the gap, thus forming an arc that would burn out the contacts in short order.

By elaborating the design of Fig. 1, as shown in Fig. 2, we can obtain a device that will operate successfully on a light or power circuit. In this case, as will be seen, we have changed the construction so that the lever *L* simply acts to hold in position another lever *L'*, which latter is connected with wire *w'* and maintains the circuit closed so long as it engages with *h*. When the current rises to the strength for which the device is set, *A* will be drawn toward *C*, as in the first figure, and the end *D* will disengage from the end *E* of lever *L'* and allow the spring *S* to contract and pull the lever out of *h*.

This construction, although operative is defective on account of not being delicate enough in its action. As will be noticed, the end *D* has to be drawn away from E

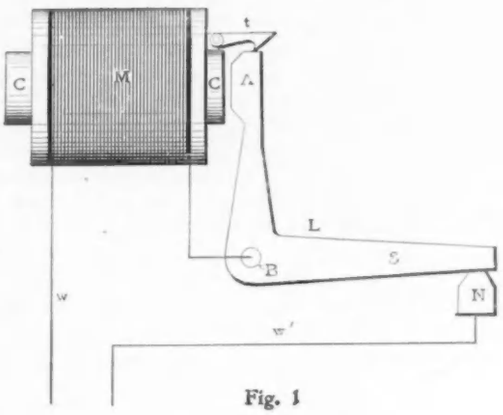


Fig. 1

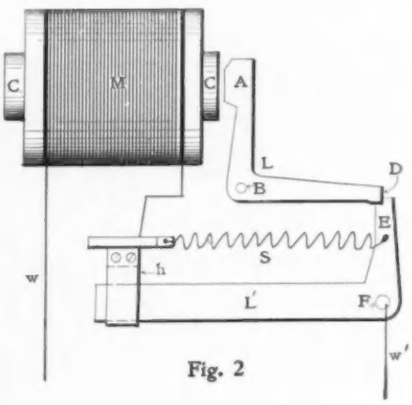


Fig. 2

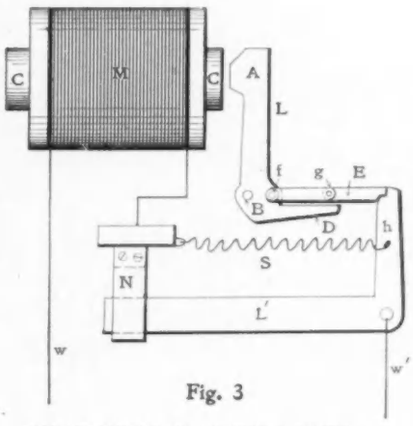


Fig. 3

THE PRINCIPLE OF CIRCUIT BREAKERS.

while subject to a considerable amount of friction, hence the magnet must exert a force sufficient to raise the weight and also overcome the friction. The force necessary to raise the weight is constant, but that required to overcome the friction is not, as frictional resistance is decidedly variable. On this account if the apparatus were set to act with a current of, say, 100 amperes, it might sometimes act with 80 amperes, and at others require 120, or even more. To make the action of the device certain, that is, so that it will always act with the same strength of current, it is necessary to eliminate the frictional resistance as far as possible. Then we will

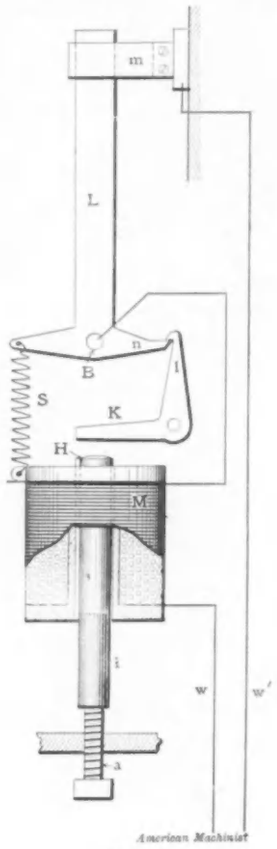


Fig. 4

have the resistance of a weight only, or of a spring, if such is used, either one of which is constant. Therefore, if set for a given current strength, the breaker will act at all times with practically the same strength. As a matter of fact, the most delicate circuit breakers will not act at all times with precisely the same circuit, for although the frictional resistance can be cut down to a very low point, what little is left of it will still be subject to variation, and to this extent the range of current strength within which the device will act will vary.

Fig. 3 shows one way of reducing the friction, which consists in using a brace jointed at the center, to hold the switch lever in place, this brace being forced out of line by the movement of the lever *L*. If the center *g* of the joint of the brace is below the line drawn through the fulcrum *f* and the support at the end *E*, the pressure of the spring *S* will only act to hold the lever *L'* more firmly in place, but when the magnet becomes sufficiently strong to attract *A* the end *D* will meet with but slight resistance in moving *g* upward, as

the friction of the two joints, *g* and *f*, can be made very small.

Fig. 4 illustrates another way in which the frictional resistance can be reduced. In this construction the magnet used is of the solenoid type. The main switch lever *L* is held in position by the catch at the end of the small lever *l*. The lower part of the plunger *i* is made of iron, and the upper part, shown in lighter shading, is made of brass. The brass is not acted upon by the magnetism, but the iron is, and there is a lifting force exerted, which, when the current becomes sufficiently strong, will actually raise *i*. As *i* is raised, the pull of the magnet upon it will increase, the result being that its velocity is accelerated rapidly, and as a result the end *H* strikes the end *k* of the small lever an actual blow, the jar of which is sufficient to dislodge the catch at the upper end, and thus release the switch *L*. By varying the position of *i*, the force exerted upon it by the coil is changed; that is, changed for the same strength of current. If the adjusting screw *a* is lowered, the pull of the coil is reduced and if *a* is run up, the pull is increased. From this it can be seen that by adjusting *a* the breaker can be set to open the circuit with different strengths of current.

The principles illustrated in Figs. 3 and 4 are those used in the construction of commercial circuit breakers, the latter type being by far the most common. One of the best known circuit breakers involving this principle is the I T E, manufactured by the Cutter Company, of Philadelphia. The construction and action of this circuit breaker can be readily understood from Figs. 5 and 6, the first of which is a line drawing, showing a portion of the magnetizing coil removed to reveal the interior mechanism, while the second is a photographic view of the actual apparatus.

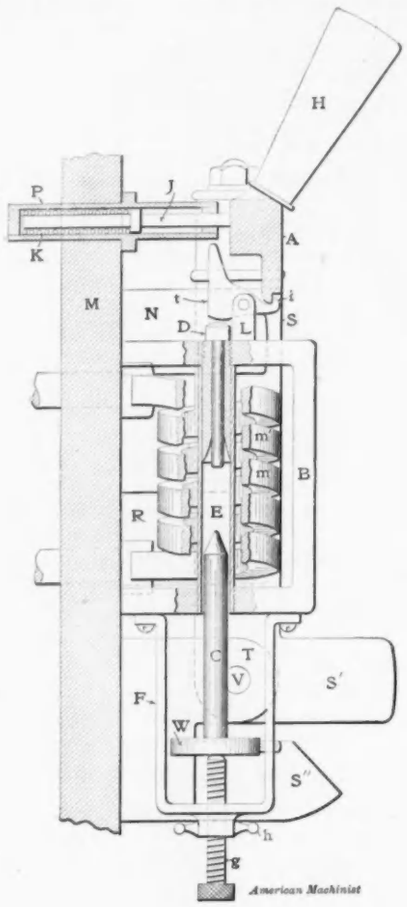


Fig. 5

SECTION OF THE I T E CIRCUIT BREAKER.

In Fig. 5 *S* is the switch lever *L* of Fig. 4, and *t* is the small lever *l*. The switch lever *S* is carried by a frame *A*, to which the handle *H* is attached. The hook upon the end of *t* engages with a suitable projection of *A* at *i*. The iron core *C* is not provided with a brass extension as is *i* in Fig. 4, but pin *D* takes the part of this extension. The lower end of *C* is guided in *F* by means of a pin in the rim of the flange *W*. When the current reaches the strength for which the device is set, *C* is drawn up into the tube *E* by the magnet coil *m m* and strikes *D*, which latter transmits the blow to *t*, and thus releases the hook at *i*. At the same time the upper end of *t* hits the frame *A*, tending to push it outward. The rod *J*, which moves in the tube *P*, is pressed forward by the spring *k*, and as soon as *t* releases *A* the switch is forced outward and falls until the stop *S'* reaches *S''*. The screw *g* is the adjusting screw *a* of Fig. 4, and it is provided with the jam nut *h* to hold it firmly in the position set.

In Fig. 6 the parts that are in sight are marked to correspond with Fig. 5, and by the aid of the two figures the construction can be thoroughly understood. In connecting this circuit breaker in the circuit the lower end of the magnet coil *m m* is connected with one terminal coming from the generator, a connecting stud being provided for that purpose, as shown at the back in Fig. 5. After passing through the magnet coil, the current goes to the contact *N*, from which it passes through the right-side blade of the switch to contact *R*, and from here goes out to the distributing circuits. The return current enters the breaker through the top contact on the left side and passes through the switch blade to the bottom terminal, and thus back to the generator. The circuit is clearly shown in broken lines. The hinges *T*, upon which the switch blades swing, are not traversed by the current, which, as seen, passes from *N* to *R* on each side. This particular design of

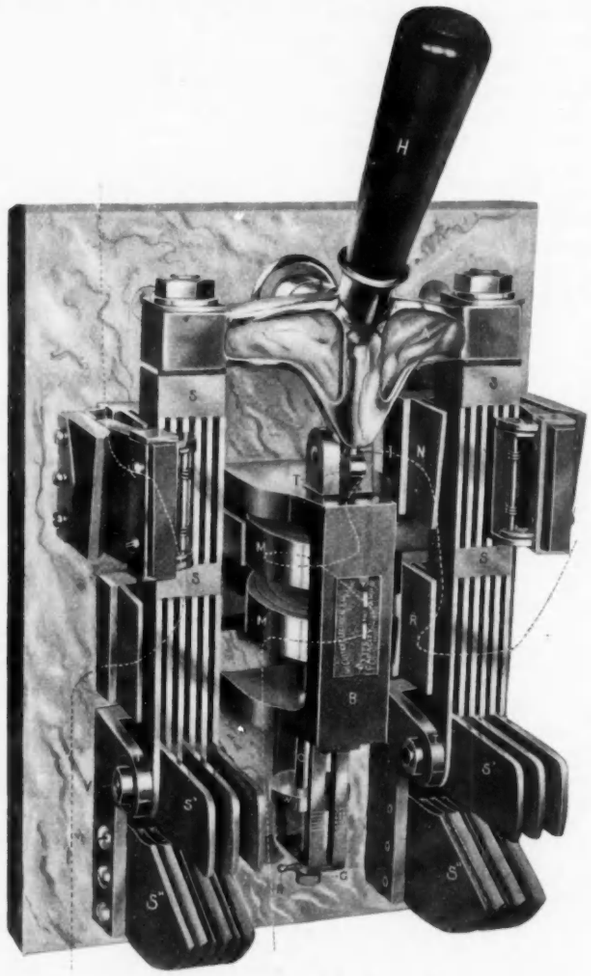


FIG. 6. THE I T E CIRCUIT BREAKER.

breaker, therefore, is of the double-break two-pole type.

The Cutter Company makes a great many different designs of circuit breakers —some single-pole, some two-pole and some three-pole. They are also made single and double break. The breaker shown in Fig. 6 is intended for currents ranging from 800 to 1,500 amperes, and may be adjusted to act anywhere within these limits by means of the screw *g*. Carbon contact points will be seen in Fig. 6, the object of which was explained in the articles on switches.

Flywheel Effects on Shafting.

BY W. H. BOOTH.

Considerable discussion has recently arisen on this side in connection with the subject of crank shafts and flywheels. The discussion arose in respect of some 5,000 horse-power engines for a tramway power house in Glasgow, which were specified for on the lines usual, we are informed, in America; namely, extremely heavy engines at very low speeds of rotation. In passing, it is, perhaps, worth while to notice the curious interchange of ideas between this country and America. Some few years ago we were accustomed to look to America as the home of high-speed engines, while here the old standing influence of the beam engine had kept down speeds of rotation. Now all this seems to have changed. English engines are of high rotative speeds, and it is only American engineers who are on this side who specify slow speeds. Thus, the Glasgow engines, over which there has been quite a little fuss, are only intended to run at a speed of 75 turns per minute, with a stroke of 5 feet. As one writer has pointed out. this is only about half as quick as some of the engines in the navy and in the mercantile marine. The flywheels of the Glasgow engines are to weigh about 220,000 pounds, or four times what they would weigh at twice the speed, or rather, I should say, eight times as much, for at double speed the need for flywheel energy is halved. For a given power the weight of wheel necessary really varies inversely as the cube of the speed. For my own part, I rather like a low-speed engine; it looks well, and no engine ever has come up in appearance to some of the huge beam engines to which I was first accustomed. But high speed is almost essential in lighting and in electric traction work, and I have felt doubtful as to the amount of reliance to be placed on the statement that excessively low speeds are really to be taken as characterizing all American tramway traction work. However, to let this pass, the discussion has brought forward two sets of opinions on another point, and that is the strength of the engine shaft to resist the "sudden large variations of stress caused by varying loads on the line or by short circuits." It appears that the shaft of the Glasgow engines are to be about double the diameter of similar shafts in marine work, which, it is considered by some, are exposed to stresses very much more severe than the shaft of a traction generator, because the propeller of a ship is at times liable to be alternately flung into the air and then suddenly plunged into solid, unyielding water, whereas the worst that can happen to a generator is an increase of a retarding influence, which has no inertia effect and cannot, therefore, produce such severe shocks as are produced by the attempt to suddenly move a mass of water. Certain conclusions seem to have been accepted by all. One of these is that the flywheel of an engine protects everything behind it from the stresses due to variable load. Another is that so long as the flywheel is placed between an engine and its load the engine cannot suffer from any load variations, however sudden.

With modern sensitive governors the change of load from nothing to a maximum is effected with very little speed alteration. Such little as there is gives the governor its full movement, and whereas one stroke may have been performed with a little breath of steam only, the next stroke may be made with full steam carried to the latest point of the stroke. To a superficial observer this may appear to be productive of severe stresses. But on taking thought, it is clear that no stresses are caused beyond what are fully provided for in all well-designed engines. The maximum stress in an engine is caused, as regards the engine, on the dead points, by full boiler pressure admitted on the piston. This is a stress which ought to come upon every engine twice every revolution, and may at once be dismissed as ordinary. The maximum crank energy is produced when full boiler pressure is carried to about half stroke. Now, this is a stress that every well-designed engine is intended some time to withstand. Locomotives bear it many times daily. But how about a sudden transition from no load to full load? There is absolutely nothing in this to cause alarm. Excepting the crank and the big end of the rod an engine comes absolutely to rest twice every revolution. Every stroke stands by itself. No stresses come over from the previous stroke. The engine *does not know,* to use a well-known term, whether the last previous stroke was done with much steam or little. In fact, it is certain, and all will be convinced who think it out, that the engine is not affected beyond the flywheel. This being so, it becomes a necessity that good design should not place the flywheel on the opposite end of the shaft from that occupied by the armature of the generator, or by the belt pulley. In English practice now all driving is done direct, the armature being on the projecting end of the engine shaft. We have now isolated the severe stresses and got them between the flywheel and the generator. As regards their magnitude, the opinion prevails here that the stresses of traction work have been much overrated, and that even when a short circuit of current does occur the rapidity with which the retardation effort due to heavy current is built up in the generator is not so great but that the automatic cut-out will have time to act and prevent the enormous flows of current so much feared, that, in fact, the exchange of energy between flywheel and armature is not absolutely instantaneous and the shaft will not be twisted off, as might be expected. Putting aside all questions of the load of the flywheel, it is, however, certain that an allowance requires to be made in a shaft for the excess of stress produced by even moderately sudden accession of load, the effect of which must be, if not doubled, at least increased by a large percentage for sudden application; for all flywheel energy called out by slowing down of the engine under the braking action of the armature is transmitted through the piece of shaft between the flywheel and the generator. The moral to be drawn from this is that the highest safety is to be secured by eliminating all such stresses, which can only be done by making the flywheel part of the generator, leaving to the shaft its proper duties of carrying the armature and transmitting the power of the engine, but not asking it to deal with the stresses thrown back from a variation of load. Alternating current machines have long been made on this system, but ordinary traction generators have not usually had so close a connection of flywheel and rotating armature. Yet it is certain that as regards the mechanical aspect of design, this is the best way to design for any sort of work, and particularly for the very variable loads of tramway traction.

London, England.

[Our understanding of the reason given by their designers for the large shafts of the American engines offered for the Glasgow tramways was the avoidance of wear and the consequent settling of the shaft and armature. This settling, if allowed to take place, results in throwing the armature out of concentricity with the field magnets, and this, in turn, by its destruction of the magnetic balance, throws a great increase of load on the bearings. The wear is thus self-accelerating, and extreme measures for its prevention are justifiable.—Ed.]

Australian Patent Rights and Wrongs.

The second number of "The Commonwealth," a monthly published at Melbourne, New South Wales, contains an interesting article, with the above title, by George Garibaldi Turri. The paper gives us information upon the patent system of Australia, with suggestions for its improvement. It is said that the notion has prevailed that the patent laws of a coun-

try are for the benefit of the inventor, when really they are primarily for the benefit of all the people, and only incidentally, though in the long run necessarily, beneficial to the inventor. The patent system of the United States is held up as the ideal system, which it may well be considered in contrast with what is shown of the Australian system. A patent for the seven Australasian colonies of New South Wales, Victoria, Queensland, South Australia, West Australia, Tasmania and New Zealand, with a total population of but 3,000,000, costs at present about £70 ($350), but, as the result of the Federation now in process of accomplishment, this cost will be reduced to £20 ($100). In addition to the single and reduced fee will also be secured the many other advantages of a single Patent Office, with its single staff, and especially the single decisions as to novelty and patentability, instead of several conflicting ones. The paper states, although there is no indication of the sources of the writer's information, that in the United States 80 per cent. of all the manufacturing capital invested is directly or indirectly based upon patented American inventions, while in Australia not 3 per cent. is based upon Australian invention.

A most absurd and unjust feature of the Australian law is thus spoken of:

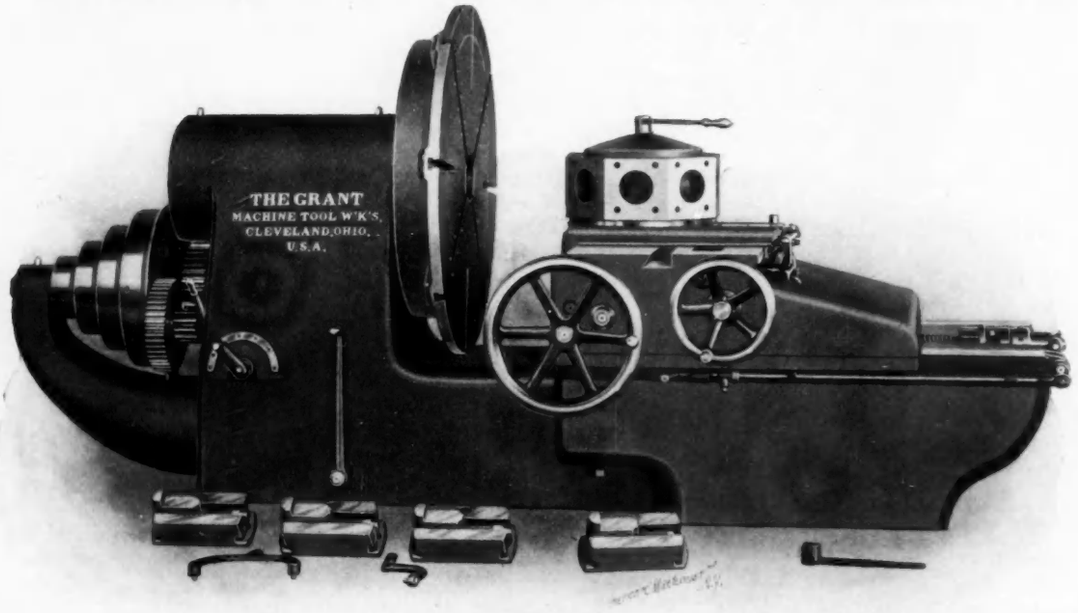
"The American patent system has a different basis to the Australian. The former treats the inventor as having a constitutional right to be awarded a patent; and the law for sixty years past has allowed the inventor to use his invention in public for two years *before* he need incur the expense of applying for a patent. Australia makes the giving of a patent a favor; whilst so greatly is the patent grudged that the proved disclosure of the invention before application for a patent renders the patent void, although such disclosure is often essential for testing the invention."

Complaint is made of the lack of any suitable library in which the patent records of the world are conveniently classified for reference. For this and other reasons the reports of the patent examiners as to novelty are of little value, and the patents granted are quite likely to be overthrown. Where the inventor undertakes to look up the matter for himself, he soon gives it up as useless.

"An ingenious man went to the Victorian office to inquire whether a certain idea was worth following. It related to an article used in the export trade. The Patent Office refused to allow him to see any specifications, however old, without he paid a shilling [25 cents] each, and gave him no guidance whether what he sought was there or not. After spending many shillings he could ill afford, he had to leave without satisfaction. He complained of the cost; the official consolation was that greater expense in searching was often incurred by others."

The writer claims that the present system distinctly favors the foreign inventor.

"To-day the German or other foreigner can say, 'I will establish no factory and allow of no factory in Victoria. The law does not (as it would in Europe) provide for compelling me to do one or the other. I have a patent, and I will compel people who want my telephone or typewriter, etc., etc., to *import* from me and pay my price. Had Australia refused me a patent, no doubt some capitalist there would start manufacturing or would import the goods at a cheaper rate from some country where I hold no patent. Had Australia followed Canada's system, or Germany's, or that of any European country, my patent would be conditional on my manufacturing locally, and of course I would patent even then.' But Australia's laws do not encourage its *own* people—and Victoria least of all. The requirement that no invention made within the colony shall be patentable one day after it ceases to be novel, makes many of the patents which are secured cover crude inventions that come to nothing. The Patent Office in America does not stifle inventions so—it gives two years' right of prior public use. Ninety-nine Germans out of a hundred who ask for Victorian patents get them; but only one Victorian inventor out of ten who applies for a German patent is permitted such a monopoly; the rest are refused."



44-INCH TURRET CHUCKING AND RING TURNING LATHE.

44-inch Turret Chucking and Turning Lathe.

In the manufacture of steel balls certain rings are used in the grinding machines, which rings wear rapidly by the action of the abrasive material, and yet they must be kept in good shape. This, where any considerable numbers of such balls are made, involves doing a great deal of special lathe work to make and keep these rings in order. For this work John J. Grant designed and built the first of the machines which we here illustrate, and long before he had thought of building one for others, told the writer that he considered it one of the most important means by which he had been enabled to manufacture steel balls at a profit when prices were so little above the cost of raw material as to make a profit seem almost impossible.

Recently several of the machines have

been installed in other shops for doing other work, and it has been improved to widen its scope somewhat and make it useful for classes of work not originally contemplated—such work, for instance, as is done in locomotive, engine and pump shops.

As will be seen, it is of the turret family, but has been made with special reference to very heavy work and yet so as to be handled rapidly and easily. The head-stock is cast solid with the bed and carries a spindle 9 inches in diameter at the front journal, which is 12 inches long.

Since the date of the drawing from which our sectional view is made, a change has been made in the method of driving, so that the pinion now engages with an internal gear upon the face-plate, which, of course, is of larger diameter and gives a better drive.

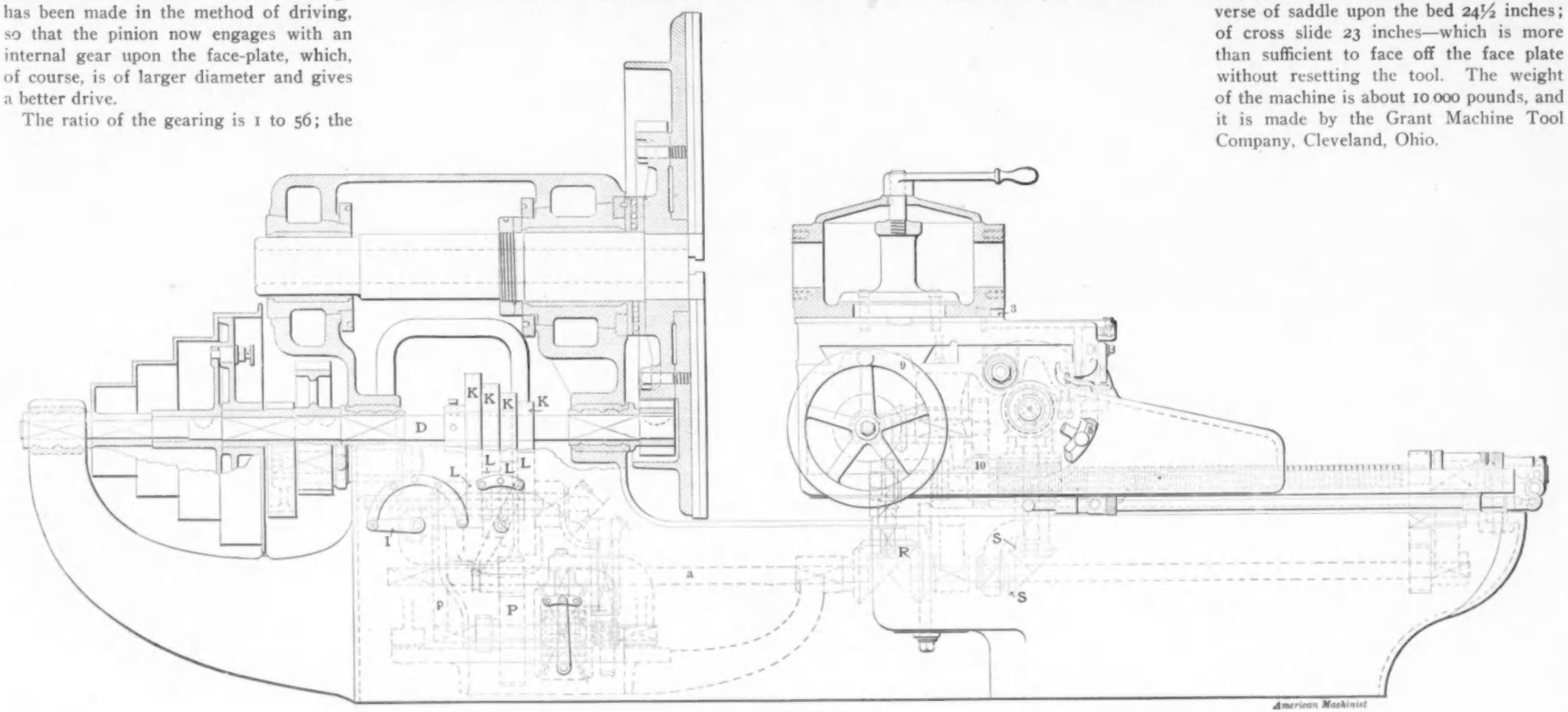
The ratio of the gearing is 1 to 56; the cone pulley is 8 to 20 inches in diameter for a 3½-inch belt, and the speed of the spindle from 2 to 100 turns per minute.

The method of taking the feed motions from the pinion shaft is shown in the drawing, where an arrangement of cone gears is shown at *K* and *L*, the sliding key being shifted by rack teeth turned on the end of the shaft which passes through the sleeve on which the gears *L* are mounted. These transmit motion by means of the miter gears at the right to a short, vertical shaft, on which is a worm *M* that drives a horizontal shaft on which the feed-reversing clutch is arranged, and which drives the shaft *a* at two different rates by means of the shifting gear arrangement *P p*.

The turret saddle is not fitted direct to the bed of the machine, but to a heavy swinging plate which is pivoted at the center of the miter gear *R*, and can swing to an angle sufficient to permit boring tapers up to 3 inches to the foot. This swinging plate is clamped to the bed in any position, and is adjusted by a screw at the rear end. The lead-screw and the splined shaft *T* are both carried by the swinging plate, and the screw is driven from the shaft *T* by means of the spur gears shown at the extreme right, where there is also a clutch by which the lead-screw is, either automatically or by hand, disengaged. For the hand motion of the turret saddle the nut is rotated by means of the large hand-wheel 9 and the miter and spur gears 10.

From the splined shaft *T* the motion for the cross slide on the saddle is also derived through the miter gears *s s*, and there is an automatic release for this feed motion as well, the mechanism for this being shown at the right of the smaller hand-wheel *B*.

The turret has eight holes 4 inches in diameter, and tools can be bolted to its face. The hole through the spindle is 3¼ inches in diameter; feeds are from 1-32 to 7-32 inch per rotation of spindle; traverse of saddle upon the bed 24½ inches; of cross slide 23 inches—which is more than sufficient to face off the face plate without resetting the tool. The weight of the machine is about 10 000 pounds, and it is made by the Grant Machine Tool Company, Cleveland, Ohio.



44-INCH TURRET CHUCKING AND RING TURNING LATHE.

The New Atlas Works, Stockholm.

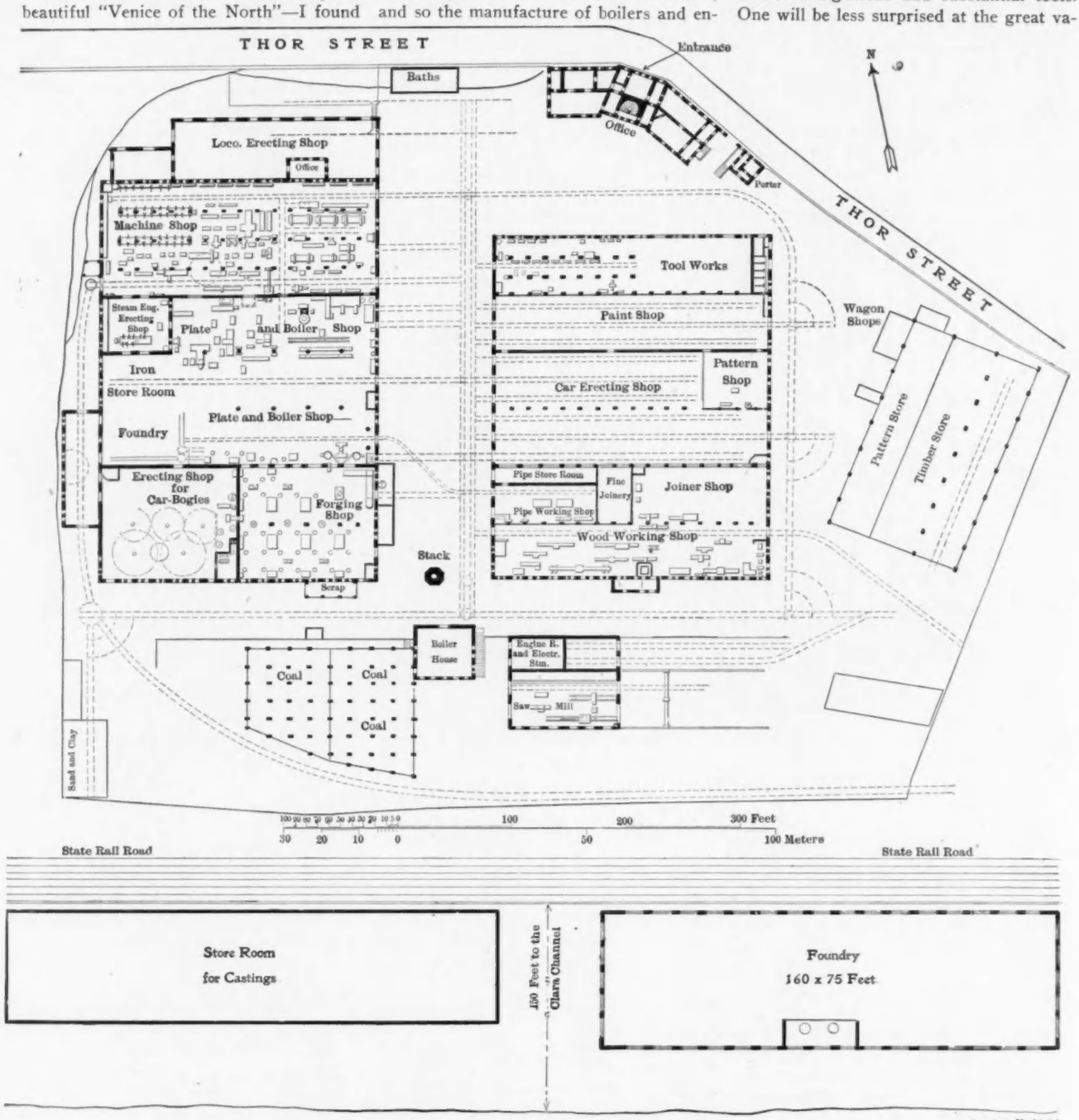
Most exhibitors in the machinery department of the Centennial Exhibition will remember a Swedish engineer in charge of the Bollinder exhibit, who went about with a sketch book seeking what he could absorb in the way of "Yankee tricks" and such like for home consumption.

On a recent visit to Stockholm—that beautiful "Venice of the North"—I found this same energetic individual, after having "made his pile" and retired, again in harness as the managing spirit in the mechanical department of the New Atlas Works, busy as a nailer, and glad to see old American acquaintances and to show them his shops, and his city and surroundings.

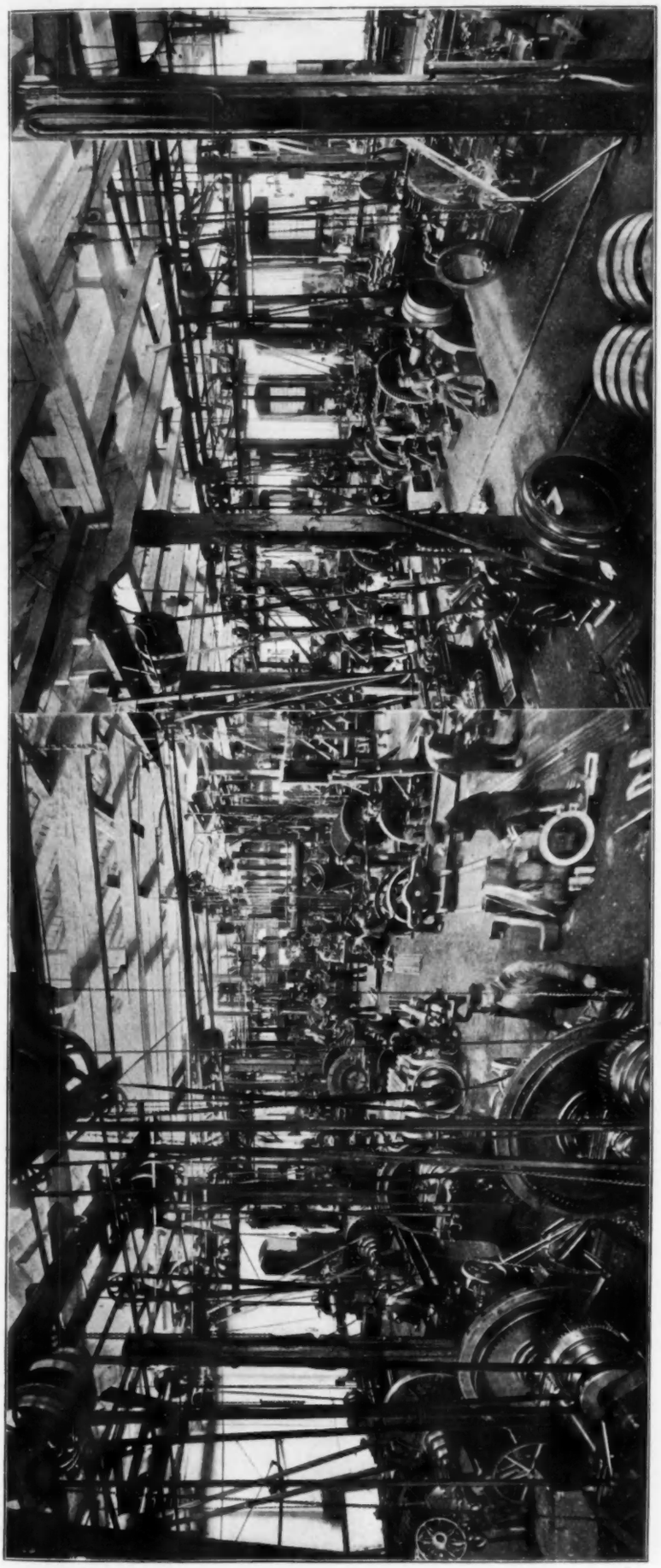
The accompanying description, made from notes taken on the spot (as well as "on the fly"), should prove interesting to all Americans who want to know how things are done in far-off Stockholm.

The works were built in 1873 for building railway cars, but after a few years there was found to be too much room for the work, or too little work for the room, and so the manufacture of boilers and engines was started, and other different jobs were taken. In 1887, when only 280 workmen were occupied, there was needed a new article of manufacture, and so the works took hold of steam heating and ventilating installations—especially for hospitals and other large buildings. In this line they were successful, and as the hospitals and prisons also wanted steam cooking and washing apparatus, they were naturally led to make these also. The system of heating is mostly low-pressure steam.

Later along the concern made machine tools, partly because it wanted some which it could not buy and partly because Mr. Jacobs and Mr. Lamm take a special interest in ingenious and substantial tools. One will be less surprised at the great variety of machines, etc., here made when one bears in mind a remark of Director Lamm's: "We never send away a good workman, and therefore must find something for him to do, even if orders should be wanting." This is a doctrine which will bear discussing as thoroughly as the matter of "carrying the message to Gar-



PLAN OF THE ATLAS WORKS, STOCKHOLM, SWEDEN.



INTERIOR VIEW OF MACHINE SHOP, ATLAS WORKS, STOCKHOLM.

cia." The number of men now employed is 820, and the number of machine tools in use 330—a much larger proportion than in German shops. The value of the output last year was 2,700,000 kronor, or, say, $723 600, of which about 1,000,000 kronor, or $268,000, was for railway cars and about 400,000 kronor, or $107,200, for heating and ventilating apparatus. This ciphers up to about $900 per man per year, on the assumption that there were 800 men employed, which is probably more than were at work.

The present area covered by the Atlas Works is bounded on the north by Thor street, south by the Karlsberg canal, on the west by Rörstrand street and on the east by the repair workshops of the Government railway. The works have good traffic communication through the canal with Lake Mälar; by means of the Northern Railway and the Vesteros-Bergslag Railway with the country at large, and by the Vasastadt Tramway with Stockholm itself.

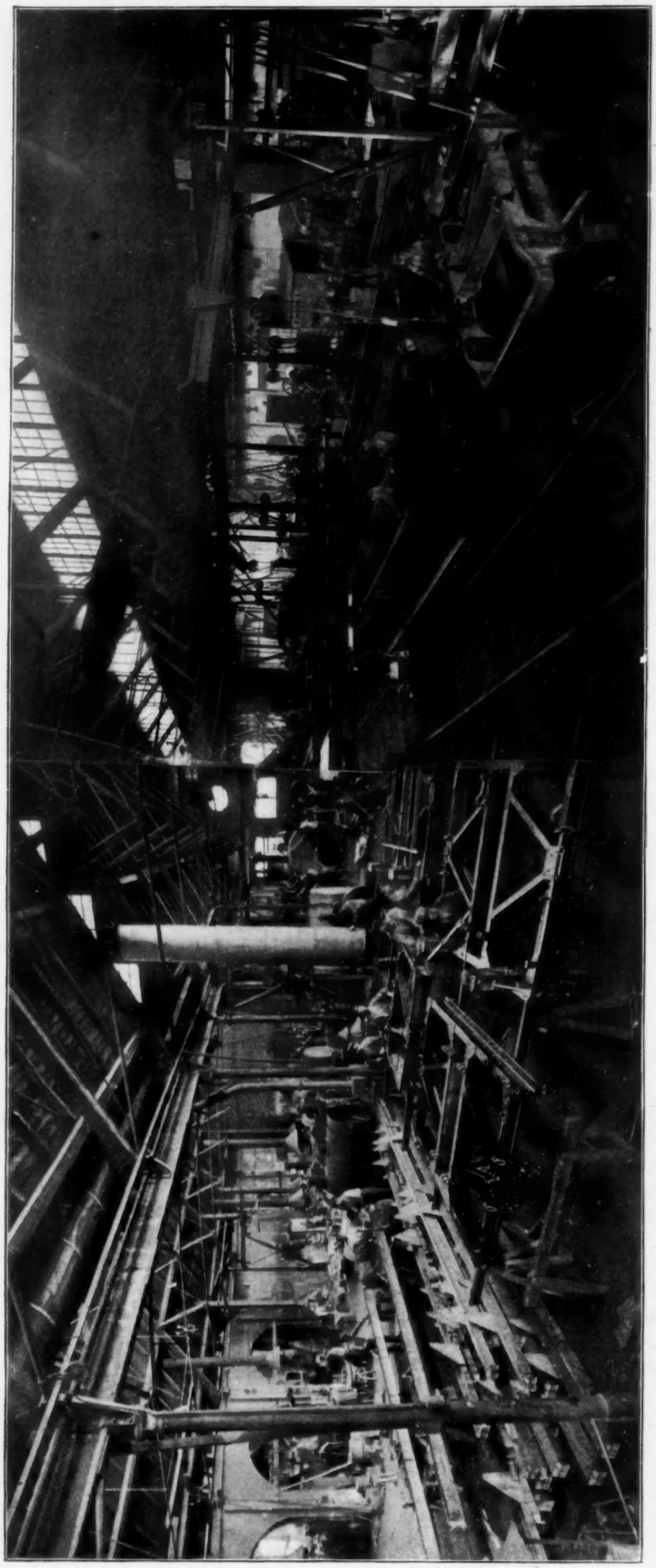
On the upper of the two plateaus which compose the plot of ground now occupied by the works stand the main buildings. These are in two sets, the larger of which covers 107 by 71 meters, equalling about 82,000 square feet. The smaller set covers 92 by 71 meters, or, say, 78,000 square feet.

Passing through the main entrance gateway on "Thorgatan," or Thor street, we go westward past the business offices and drafting rooms, which are in the office buildings, to the locomotive erecting shop, where the superintendent may be found. He may be recognized by looking more like a workman than almost any other man about the establishment. South of this is the machine shop; south of this again, a large building which contains at one end the plate and boiler shop, and at the other three walled-off departments, respectively for steam engine erecting, iron storeroom and foundry—the "new" foundry, as it is still called, although, owing to circumstances, it is now the only one in blast, the "old" one being used as an erecting shop for iron car trucks.

The concern had two iron foundries, the old one for heavier castings and the new one, built in 1897, for radiators and fittings used for heating and ventilating purposes. When a new foreman was appointed for the old foundry last year, all the workmen (125) in both foundries went on strike.

To settle the dispute peaceably the Atlas Company closed the old foundry, and now gets its machine castings from other firms. But the new foundry, where nearly all the work is done with molding machines, has been running all the time, first with only a few men, gradually increasing; and there are at present at work about seventy-five, or as many as are needed.

The old foundry, which covers about 1,425 square meters (15,300 square feet), is at present used as an assembling room for wrought-iron car trucks. The new



INTERIOR VIEW OF ERECTION SHOP, ATLAS WORKS, STOCKHOLM.

iron foundry is well fitted up for its purpose; has Root's blowers, a 15 horse-power steam engine and four large and three small molding machines.

The brass foundry has a melting furnace of the usual construction and appearance. There are about seventy-five workmen employed in the foundries; of these fifty-five were molders.

From the foundry we pass back into the boiler and plate shop, well supplied with bending rolls, an American "Bull-dozer," drill presses, hot and cold saws, punching and riveting machines, etc. The riveting and caulking are largely done by compressed air.

There are two air compressors, with suitable accumulator. Here we find three cranes operated by compressed air. There are thirty-eight machines in this shop, driven by a dynamo of 30 effective horse-power.

A compressed-air hand caulking machine in active operation shows that even in little things the Atlas Works are up to date.

From the boiler shops we pass south into the smith shop or forge shop. Here there are thirty-three forges and six steam hammers. A puddling furnace handles the iron scrap. The combustion gases from this do duty in making steam to supply the steam hammers.

The principal machine shop covers 2,500 square meters, or, say, 26,500 square feet, containing 135 machine tools, of which fifty-three are lathes and thirty boring machines and drill presses. There are a good hydraulic press, three smaller presses and three small plate shears. The largest planing machine can handle work up to 1,800x1,800 millimeters with a length of 5,000 millimeters. The heaviest lathes swing 4,300 millimeters, with a length between centers of 4,000 millimeters. There are several engine and screw-cutting lathes here, of American type, most of them, however, made in the works themselves. Especially noteworthy were a universal horizontal boring mill and a radial drill, both made in the works. The first of these has automatic feed in all three directions, and in it the work can be bored from all sides as the upper table rotates. The machine weighs about 14,000 kg. = 30,800 pounds av. The assembling shops, or erecting shops, so called, have a number of heavy universal radial drilling machines.

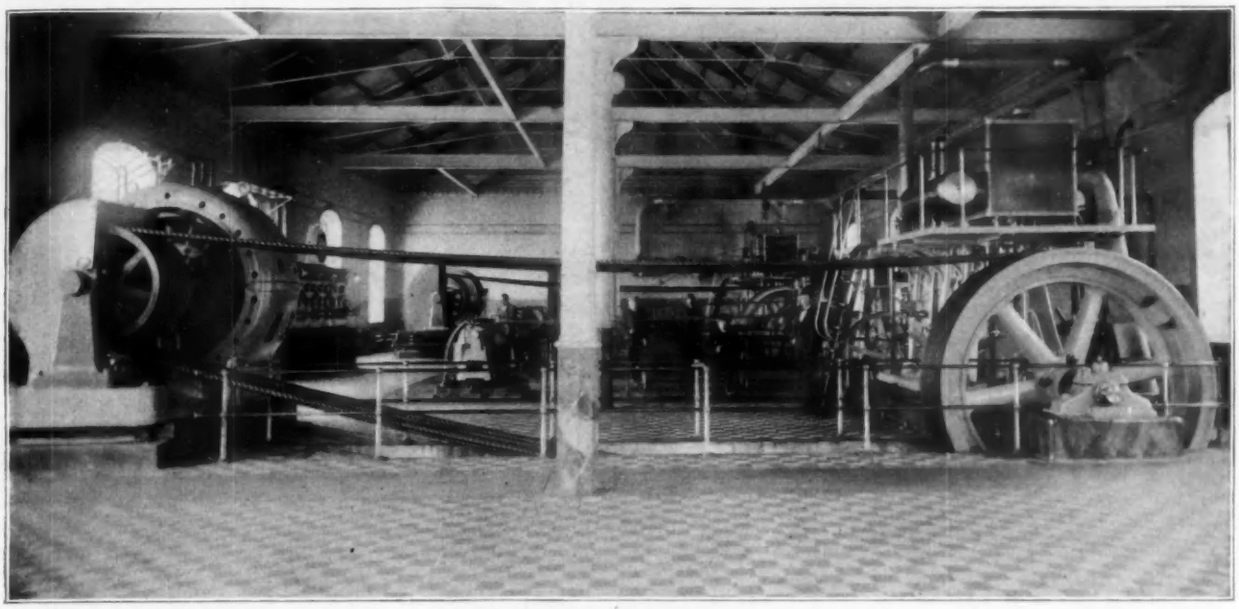
The machine tools in the main machine shops get their power from a 100 horse-power compound steam engine.

One of the most prominent tools in the shops is a milling machine which is a sort of combination of an "Ingersoll" miller and a "Pit" planer, as the tool-carrying head moves and the work remains stationary. This machine takes in 800x800x4,000 millimeters, or say 31.4x31.4x63 inches; and it could readily be extended to take in any length. It has both horizontal and vertical cutter-spindles, the latter being

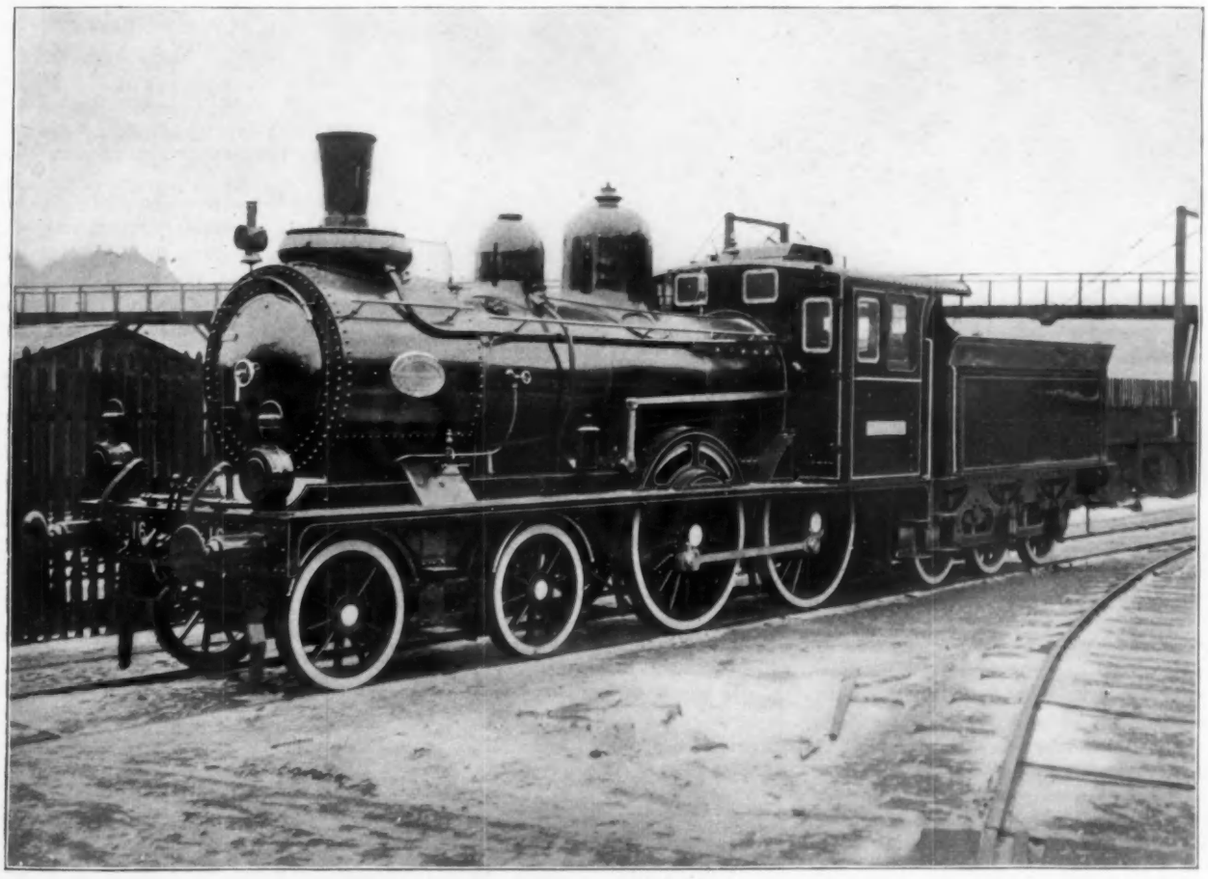
attachable to one of the uprights. The whole rig weighs 10,500 kg. = 23,150 pounds, and costs f. o. b. Stockholm 9,200 kronor, or a trifle under $2,500. It may be coupled to a dynamo, direct.

Locomotive building is a branch which the concern has tried and nearly abandoned. Altogether about forty locomotives have been built here, but the firm finds the cost of manufacture too high—which is only natural when only a few at a time are made. The work was taken up at a time when orders in other lines were scarce, which is now far from being the case.

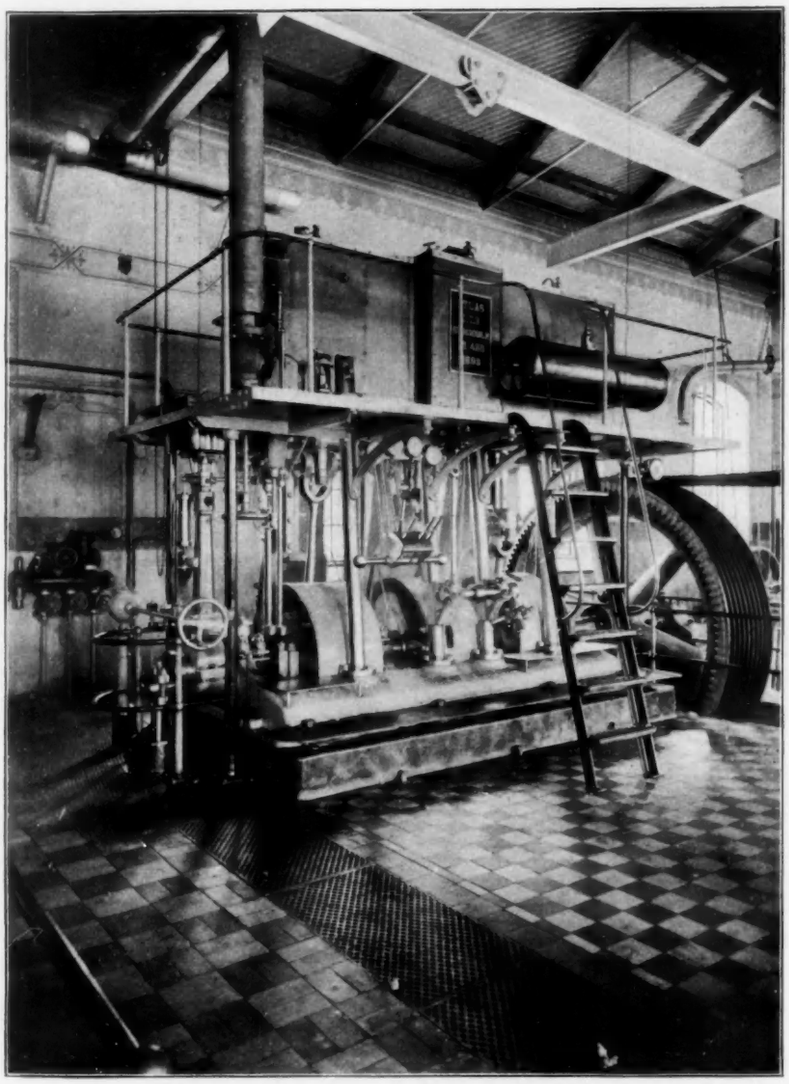
In 1891 the concern bought the Lentz patent for stayless locomotive boilers, and in 1892 supplied five of this system to the Stockholm-Saltsjöns Railway and one to another road. They seem to have answered well. The railway named has many curves and steep gradients and runs trains every hour. The only objection to the Lentz boiler seems to be that it is some-



POWER STATION FITTED WITH ATLAS ENGINES.



LOCOMOTIVE BUILT BY THE ATLAS WORKS, STOCKHOLM, SWEDEN.



250 HORSE-POWER TRIPLE-EXPANSION ENGINE, BUILT BY THE ATLAS WORKS, STOCKHOLM.

what heavier than other types of the same capacity, and that it takes more time to raise steam or increase pressure, because of its large water capacity. This large water capacity, however, gives dry steam; and the absence of staybolts makes it easy to keep the boiler clean. When necessary to repair the firebox, this is done with less expense than is usual in locomotive boilers. Up to date no new fireboxes have been required in the boilers delivered seven years ago.

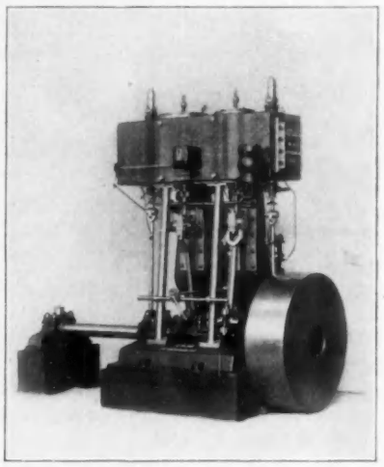
Crossing a space of about thirty meters, we come to the other and smaller set of shops, six in number. We enter first the general wood-working shops at the south end; taking about 100 horse-power and turning out all kinds of wood work for the cars, etc. In the same building are the fine joiner shops, the coppersmithy and the storeroom for pipe. North of these comes the big car-erecting shop, where are turned out all kinds of railway cars, passenger and freight, very largely of original and modern design, and all of fine, solid, well-finished workmanship.

The works now build about 300 freight cars and thirty passenger cars per year.

The pattern shop, which is in the corner of the car shop, is of the usual general character.

The paint shops come next, and the work which they put on the passenger cars is most praiseworthy.

The north end of this group of buildings is occupied by the small machine shop or tool works, where about thirty ma-

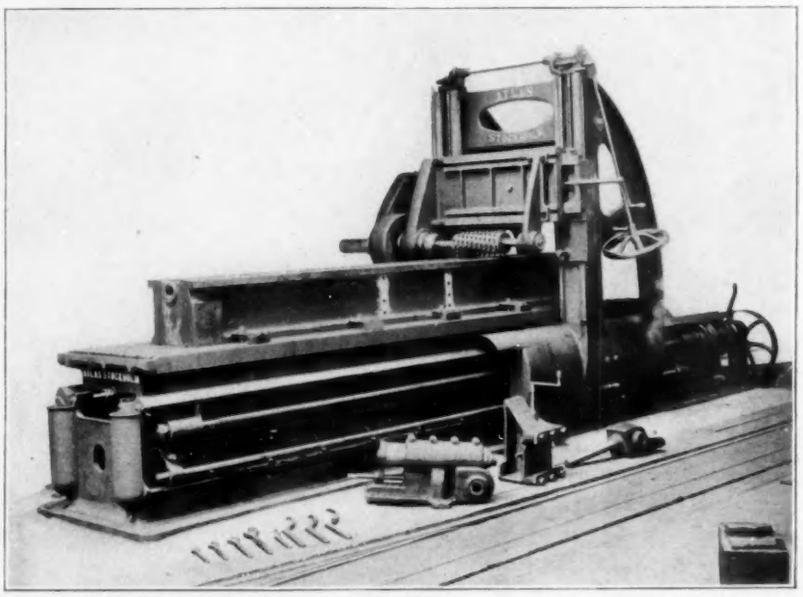


80 HORSE-POWER COMPOUND CONDENSING ENGINE, BUILT BY ATLAS WORKS.

chines are at work. Here there are built steam engines up to 300 horse-power, washing machines, steam pumps, machine tools, etc.

I send herewith a photo of a 250 horse-power triple-expansion steam engine, 320, 510 and 810 x 500 millimeters; of a compound, 320 and 550 x 450, rated at 100 horse-power; and of another compound, 290 and 500 x 400, rated at 85 horse-power.

In this shop one notes an American machine for cutting off iron rods and an



LARGE MILLING MACHINE WITH TRAVERSING HEAD, BUILT BY THE ATLAS WORKS, STOCKHOLM.

automatic screw machine of Mr. Norstedt's and one of Mr. Ryd's design. In this shop 30 horse-power is used.

The concern uses slab milling cutters with cast-iron hubs and inserted steel cutters of conical pins squared off at the cutting ends and removed by a special wrench.

In the boiler-house there are two Galloway boilers for the steam hammers and a steam hammer for railway switch forging. There is a good feed water pumper which handles the water from the canal.

The stack which carries off the products of combustion from the Galloway and the sawmill boilers is 41 meters (135 feet) high, of brick.

One of the shop boilers is of the Lentz locomotive type (without staybolts), and has a somewhat bottle-like appearance. It is well liked here.

For transporting raw and finished materials there are plenty of tracks and cranes. On the Rörstrand there are a wharf and about 200 meters of elevated railway track.

All the shops are admirably lighted. The two newer buildings in the larger set have "saw-tooth" roofs, such as our best cotton mills have. The others are lighted by clear stories or "monitors," or by roof-sash. For night work and dull days there are gas and electricity. For driving the dynamo there is a 200 horse-power compound condensing steam engine. Electric drive for the machines has been partly introduced, and its use will be extended. The power transmission is through three-phase motors.

The interior views of the shops are made up of two photographs pasted together at the center, which accounts for the broken appearance at the point of union.

Trying for a Monopoly.

We have expressed the view that large combinations of capital do not necessarily constitute a monopoly, but, on the contrary, may have to face, and often do face, the fiercest competition. Neither can we accept the absurd views of Mr. Bourke Cockran, to the effect that the producer of the best article in any given line must necessarily enjoy a monopoly; but that a large corporation may be so managed as to virtually secure a monopoly, or to suppress open and fair competition, or the reasonable possibility of such competition is clearly shown by the testimony of William H. Griffith, a tin-plate maker of Washington, Pa., who was before the Industrial Commission at Washington, D. C., on the 16th inst.

He told the commission that his company, which has since disposed of its plant, cleared 20 per cent. in profit last year, when the price of tin was $2.60 per box, the lowest ever known for plate. He also said that just previous to the passage of the McKinley bill, and for a year or so afterward, when the price was $5.65, the profit was fully 100 per cent. He said that while his company had sold its plant to the trust, the transaction had been without his sanction, and that he had since undertaken the establishment of an independent plant, also situated at Washington, Pa., which he soon would have in operation. The sale of the old plant had been made under the representation that the consolidation was necessary to prevent competition, and there had been a fear that if they did not go into the pool their business would be injured. He had not accepted this opinion, and, consequently, was preparing as rapidly as possible to re-enter the field. Nor did he accept the view that a large combination had any advantage over an individual, but believed the advantage was rather with the individual.

In re-establishing himself he had found that he was hampered in securing machinery, the American company having control of the makers of tin-plate machinery, as well as of the manufacture of plate itself. In substantiation of this statement, he said that a manufacturing company which had entered into an agreement with him to supply him for five years had already refused to fill an order after an official of the trust had become a large owner of the stock of that company. The restriction, he said, also extended to the independent manufacturers of sheet iron, the American company refusing to sell to them except upon the stipulation that they should not sell their product to the makers of tin plate. Furthermore, the combination refused to supply jobbers and others with their especial brands except on condition that they assign their brands to the trust. There was a similar restriction upon block plate, and half the "dippers" in the country had been forced out of business.

He thought the managers of some of the different plants in the trust were growing restless under these restrictions, as they were not running nearly so steadily as before the combination was effected. Of the 272 mills in the combine 80 had been closed.

Mr. Griffith said that since the trust had been organized prices of tin plate had advanced from $2.60 to $4.65 per hundred. This advance was out of proportion to the advance in wages and raw material. He made a caluculation to show that $3.84 would be a profitable price under present conditions. However, he said that, notwithstanding this advance in prices, he had reason to believe some of the members of the combination were woefully disappointed in the results. He also understood that the employees in the trust mills were becoming apprehensive, which he thought was illustrated by the fact that of the 800 rollers employed by the combination no fewer than 150 had made application to him for places in his establishment.

Mr. Griffith said that while the American company was capitalized for $50,000,000, the plants comprising the combination could have been bought at the time the combination was effected for $12,000,000. He therefore considered the company overcapitalized. He had understood that the promoters of the combination had received $10,000 000 in common stock for their services. The standard price paid for mills in forming the trust was $40,000 each. His own company had received an advance of 25 per cent. upon cash valuation.

Accused of Fraud.

O. J. Bailey, publisher of "The World's Progress" and proprietor of the American Patent Agency, at Cincinnati, O., has been on trial on a charge of using the mails to deceive and victimize patentees and dealers in patents.

In stating the case for the government the prosecuting attorney said that Mr. Bailey had been in the patent agency business in that city for twenty-three years, and that it was intended to show that his custom had been to write persons as soon as their patents were announced in "The Patent Gazette," offering to sell their inventions on commission, throwing out alluring suggestions as to values, all of which ended in demands upon the patent holders for $23 cash down, in order, ostensibly, to advertise the patents.

This advertising was through "The World's Progress," "Inventors' Manual" and other publications printed by Mr. Bailey. "The World's Progress" circulation was given as 50,000 copies per issue, when, the government claimed, the actual number printed was never over 2,500; and similarly with the other publications, 6,000 circulars were promised when from 100 to 200 only were printed.

The whole arrangement, the government claimed, was simply to interest inventors by delusive hopes, get their $23 cash, and then be rid of them in the best way possible. One way for interesting the inventors was to write, telling them that, owing to the certain and manifest great value of their inventions, the patent agency was ready to reduce its regular commission for selling from 15 per cent. to 10 per cent.

Witnesses from different parts of the country were called to prove the charges. —"National Advertiser."

It is to be hoped that this matter will not be dropped with the prosecution of one man engaged in this line of business. It is one of the persistently followed swindles of the age. It is true, however, that these swindlers would not find it worth their while to stay in the business if there were not so many inventors ready to take the word of unknown men and to put money in the hands of strangers with absolutely no assurance of a fair return. Yet most of these inventors who are thus victimized look with contempt upon the hayseed who buys green-goods or a gold brick.

Letters from Practical Men

The Linotype Machine—What It Does and How It Works.

Editor American Machinist:

The death of Mergenthaler quite naturally draws our attention to the linotype machine and sets us talking about it. Probably many of the readers of the "American Machinist" have never seen the machine, and many more know little about the working of it. I have happened quite lately to get a chance to stand by one of these machines and watch its movements, and the more I watch it the more wonderful it seems.

It is simple and easy to say what the machine does. The *linotype* makes *lines of type*. The operator has a finger board like the finger board of a typewriter, and he operates it in about the same way. When he has touched off all the letters for the words of a line, touching a key also for each space between the words, and when his work for the line is thus completed, he begins again with the next line, and so on, without waiting at all for anything to happen or to be done. He attends to his business and the machine attends to its. And that the machine is attending to its business is soon in evidence. Before the operator's manipulations for the second line are completed the machine delivers a bran new and perfect casting of the first line. We all know well enough how ordinary printers' type looks. Well, here's a line of bran new type all frozen together into a single solid block, or at least it looks like that; but instead of a lot of type the line produced is really a stereotype or casting of a line of type, identical in shape and in every dimension with a line of actual type, so that it is not at all like the thin plates of the usual stereotypes or electrotypes, which have to be mounted on wooden blocks of the proper thickness before they can be used. The linotype is complete in itself, and ready for immediate use in making up a form with other type, with cuts or halftones, or anything else as may be required.

The linotype machine is not a type-setting or a type-distributing machine. It discards the use of printers' type entirely in its operations, and, in fact, supersedes and does away with the great invention of Gutenberg. What the machine really handles are matrices or molds for forming the faces of the letters or other characters, one matrix for each such character, and these remain in the machine, are constantly automatically redistributed, and are used over and over again. Several of the matrices for each letter or character used are, of course, always in place in the machine, waiting for the touch of the operator. Each descends by its own channel when its key is touched, these channels being vertical at first, but curving and converging towards the left as they descend, the matrix being finally dropped upon a swift running inclined belt, which lands it in its place in the line that is being formed. These matrices are not much more than an inch long, and are made of brass; while the spacers that come between the words are four or five inches long, and are made of steel. The spacers are tapered sidewise, and when all the words or syllables are in the line and the length of the line is still not quite filled, these taper spacers are all advanced together until the line is of the required length, so that then all the spaces in the line are of the same width, and linotype work is thus, therefore, always more correctly spaced or justified than hand work can ever be. This justification of the line is attended to automatically by the machine after the operator has completed his work upon it.

The machine has a constantly running electric motor and also a pot of melted type metal, heated by gas and kept constantly at the proper temperature. When the operator has completed his line, and wants to go on with the next, his right hand brings down a lever which lifts the line of matrices and spaces about six inches and entirely out of his way. The same movement of the lever operates a clutch which sets in motion the main cam shaft, one revolution of which produces a complete cycle of the operations involved in casting and delivering the linotype and in redistributing the matrices and spacers. This cycle of operations goes on, after it is once started, entirely regardless of whether the operator goes on with his keyboard manipulation or not. The line is first slid to the left and then it goes vertically down out of sight, and here the linotype is cast. The matrices, it will be remembered, contain on their bottom faces the molds for the formation of the faces of the type. The mold for the body of the linotype is a permanent part of the mysterious and invisible region where the casting goes on. I am of course only telling here what can be seen by a casual onlooker, and not one specially instructed in the details and intricacies of the mechanism. After disappearing for about five seconds, during which the casting has been done, the line of pieces rises into sight again, and is carried, say, six inches higher than on its previous lateral movement before descending. At this level it is slid to the right, a long arm comes down and hooks over the matrices, lifting them out by hooking over the tops of them, which are wider than the spacers, and they are swung to the top and back of the machine and slid off to the right, to be dropped into their respective receptacles, ready for use again as soon as the touch of the key releases them. The distribution is accomplished by simply jogging the matrices along to the right, which is done by a constantly running mechanism, the matrices being endowed with the power of each selecting its proper opening at which to drop. This is accomplished by the differences in certain notches which are cut in the tops of the matrices, the combination being different for each letter or character employed. The spacers, which were left when the matrices were lifted out, are simply slid to the right, which leaves them all ready to successively drop down into the line when the space key is touched, and this is all the distribution required for the spacers. Before the completion of the cycle of operations the cast and finished linotype is delivered close to the operator's hand. The time for the entire cycle of operation is only about ten seconds, and if the operator is working lively there may be only a second or two between the completion of one cycle and the beginning of the next. The cam shaft always comes to a standstill at the completion of its rotation, and remains so until started again by the operator. The line of type which is being set up is always close to the free sight and touch of the operator, so that he can see and know precisely what is going on, and he can insert or remove characters as he will, or make any corrections by hand as well as when setting common type. The machine is not to be run by a child or by one who can simply finger the keyboard, but for one fully accustomed to its ways it does marvelously correct and beautiful work, and a lot of it.

This is only a crude and most incomplete sketch of the movements of a most wonderful machine which every mechanic should see and study as he has opportunity. Not only will the combination and co-operation of the great number of ingenious devices challenge his admiration, but also the minute precision of manufacture and adjustment. It is a marvelous and, as far as I know, an unparalleled achievement not only of the mechanical inventor, but also of the constructor.

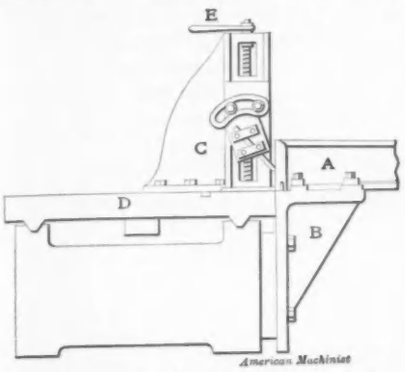
Philadelphia. MORRIS FULTON.

A Planer Job.—Automatic Feed by a String.

Editor American Machinist:

Several years ago I worked in a shop where frequently heavy jobs had to be handled with light tools. One of these jobs was an upright, shown in the sketch at *A*, lying on its side. The casting was about 10 feet long and 72 by 18 inches at the base, which had to be planed off. There were a good many of these castings to machine at various times, and they were considered something of a nuisance, as there was no planer large enough to machine them in the ordinary way, and no traveling crane to handle them. They had to be towed across the shop on a four-wheel truck of altogether too small dimensions for such a load, and this operation required the services of several strong laborers, those not actively engaged in the hauling supporting the unwieldy load at

the sides to prevent its listing dangerously. The sketch shows the planer from the rear end, the planing operation being performed back of the uprights, which are not shown; the tool, of course, cutting on the slow travel of the table. The angle iron *B* was fastened to the side of the planer, and to this angle iron the casting was strapped; the outer end, not shown in the sketch, being supported by blocking from the floor. The casting *C*, which was



A PLANER JOB—AUTOMATIC FEED BY A STRING.

fastened to the planer platen *D*, had a tool slide fitted to it, operated by the vertical screw seen in the sketch. The casting *C* was, of course, well braced at the rear, as well as sideways, in order to stiffen it, and was tongued to facilitate in locating as well as in holding it on the table.

For some time it was customary for the man running this job to ride back and forth on the table, feeding the tool by hand. Finally, someone who tired of this somewhat monotonous job, put a ratchet drill, the handle of which is shown at *E*, on the feed screw and tied two pieces of strong cord to the handle, then carried one cord in each direction parallel to the planer ways, and fastened the ends to beams overhead. One cord was of such a length that as the table neared the end of its forward run the cord tightened, drawing the handle around far enough to give the desired feed. As the table ran back the opposite cord tightened, pulling the ratchet handle back in position to give the feed at the end of the next forward run.

RAUNALT F. KEYS.

Bad Arrangement of Forge Piping.

Editor American Machinist:

In a new railroad repair shop in Canada I recently saw a striking example of how not to do a thing. A new set of forges had been put in, as shown on the accompanying sketch, three in the machine shop and one in the boiler shop. These forges are indicated at *F F*, and are of the down-draft type. They are so called because the smoke and gases are exhausted from hoods at the back of the fires, through underground tile piping, to a fan which expels them into the atmosphere. In this particular case, however, they are delivered back to the fires again by underground blast pipes. The heavy dotted lines on the plan show the exhaust and the light dotted lines the blast pipes.

The fan is of the exhaust type, having the pulley and bearings on one side of the fan and the inlet opening on the other. By the arrangement shown, the smoke and gases are supposed to be taken away from and blown through the fires over and over again. Should the blast be shut off from part of the forges, the increased pressure in the blast pipe lifts the weighted valve in the escape pipe, and thus allows the blast to go up the chimney. The fan was to be run at 1,800 revolutions per minute.

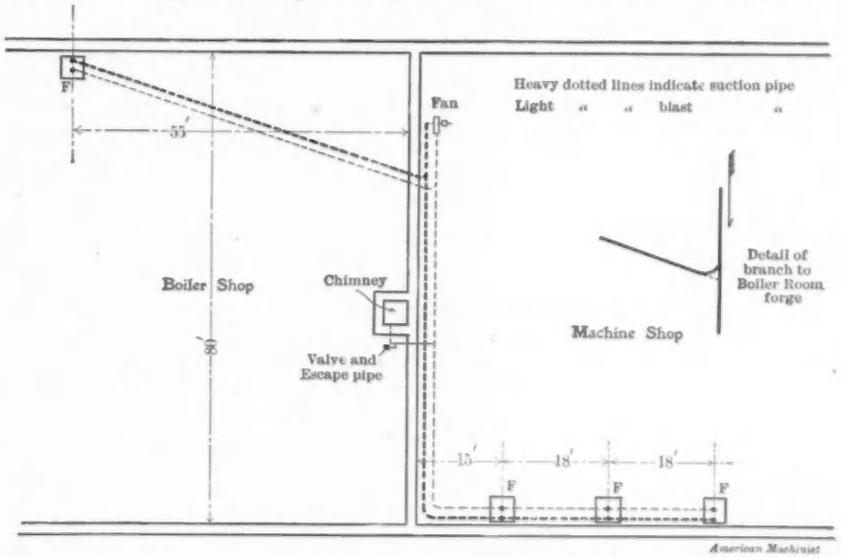
The apparatus was installed as directed, except that the fan was placed 4 feet nearer the back wall than the plan called for, thus requiring a little longer pipe. The plan also called for the blast pipe to the forge in the boiler shop to be connected to the main trunk, as shown in detail of branch connection. It was, however, put in more nearly tangential to the main current of air, as shown by the full line.

The first difficulty found in operating the forges was that sufficient blast could not be maintained to give good fires, so the fan was speeded to 2,600 revolutions per minute. Even then there was insufficient fire for heavy work, owing to the short distance between the tuyeres and the hoods. The parties putting in the apparatus claimed that the buyer had deviated from the plans, and also that the results were what they expected and have found satisfactory in other plants. At present the apparatus is not in use, and three temporary forges have been rigged up in a roundhouse, and a blast supplied by a No. 2 forge blower of another make, which had been in use with the old arrangement. This fan is belted from a 2 horse-power electric motor and runs at 2,400 revolutions per minute. It could easily take care of one or two more forges with an economical expenditure of power.

The question is not so much a comparison between different makes of fans as of an intelligent choice of blowers suitable for the work required. The small blower in question is ample, and can do its work with a small expenditure of power. The larger fan cannot do this, since it is too large to economically deliver the small amount of air at the comparatively high pressure required and absorbs too much power. On the other hand, it is a failure, in this case, as an exhauster also, since the delivery pipe is too small, and the fan has to be run at a sufficient velocity to furnish blast for the fires, which velocity is altogether too high for economical smoke exhausting or ventilating work. The arrangement of an escape pipe to the chimney is also wrong, since a constant amount of power is required, instead of an amount decreasing as the forges are shut off. A fan for removing smoke from forges should be large and run at a slow speed. It will then handle a large amount of air with a minimum amount of power.

A suitable exhaust fan with a properly designed system of piping should handle the smoke and gases from four forges with an expenditure of less than 2 horse-power. Calling the maximum amount required for the blast fan as 2 horse-power, we have a total of 4 horse-power for all the forges. By a suitable arrangement of dampers this may be decreased, as the forges are shut off. On the other hand, the present arrangement calls for a constant of 17 horse-power, or an excess of 13 horse-power. The railroad people buy their electric current, and pay in the neighborhood of, say, $50 per horse-power per year. This means a waste of $650 yearly.

This theory of blowing smoke and gases through a fire is wrong, since the fires require fresh air to supply the necessary oxygen. If the fresh air be admitted, then the smoke must be either blown into the room or mysteriously condensed in some



BAD ARRANGEMENT OF FORGE PIPING.

miraculous manner within the pipes. It seems strange that in these days such a system could be designed and installed, and one based on such erroneous ideas.

WM. SANGSTER.

The Future of Iron.

Editor American Machinist:

The word "iron" once upon a time meant iron, and, when we so willed it, the word covered the metal in all its forms and conditions, and it designated the metal not only pure—which seldom or never was known—but iron also with more or less—and usually less, but always some—other elements accompanying or intimately associated with it. Of late, we have acquired the bad habit, and the habit has engendered the necessity of saying and writing and printing "iron and steel," when we have merely meant to include in the term, as of old, whatever comes out of our iron mines. Let us save our words, and again say iron when it is iron that we mean. At this time, when there is such a demand for all the products of our iron mines, our furnaces and our mills, it is quite natural that we should think a little of what the future demand may be. This we may do to quite an extent without going at all into figures. Iron is to all intents and purposes "consumed" or disappears, or ceases to be available for future use, so that more is continually called for, as truly as coal and wheat are consumed and disappear, and the necessity of keeping up a supply of iron by annual production is as imperative as with any of the other materials that we draw from Nature's storehouse. The increasing demand for iron is not, like that of wheat and the other food products, somewhat nearly proportioned to the increase in population, but goes on, and must continue to go on, at a much more rapid rate. We can each eat but about so much, but we can and do and will, it is to be presumed, continue to use more and more iron to the individual all over the earth, and where the limit may be, or when the average of consumption will be reached, no man living can indicate. Some of our iron consumption—and in fact much of it, as in our railroads, our steamships, our office and other buildings, and, perhaps not so profitably, in all our war equipment—is in the nature of an investment of acquired property, and our (we, the world) investments of iron will increase as we grow richer, and we shall grow richer as our investments increase.

The increase in the world's production and consumption of iron which has gone on so continually, if not so steadily, through all this century, and especially in the latter half of it, has been really much greater than any figures can be made to show, for the increase has gone on, notwithstanding that we have in these latter days been learning to use and apply our iron with greater economy. We have fewer chips and less waste in manipulating the material, and in our designing we so dispose and arrange it that little of it stands idle. All our structures of iron are now safely made lighter for the same service; or if not lighter, they endure service more severe. But a still greater saving of iron has been in the strengthening of it by our general conversion of it into steel, so that each pound of it is now made to do efficiently the duty of 1½ or 2 pounds as we once used it. It is well to remember, therefore, that our increased production has been greatly aided in satisfying the rapidly growing consumption by these two important factors, the economical cutting and shaping of the material to the precise requirements of each individual case, and the steeling of the iron, which has in many cases enabled 1 pound of it to do the work of 2, and in all cases has added an important fraction to the unit. The economic effects of these iron-saving agencies have become fully operative and have been discounted to their full value during the progress of the last few years. It is not to be presumed that anything in the future will add much to the economies of material that have now been attained. Now that we have got into the habit of testing materials, of computing stresses and of adapting the shapes and dimensions to the precisely ascertained requirements, that is the end of that. So, also, it is not to be supposed that we shall yet discover any alloy or combination that will be to our present steel what steel now is to iron; so that we must be near the limit of saving in that direction also. If, therefore, our consumption of iron is to go on increasing at a rate in any proportion to that at which it has been going, and which shows no sign of slackening, it is very apparent that the increase in the rate of production, to keep pace with this growing demand, must go on much more rapidly than it has been going, in order to keep things even.

Of the future demand for iron, and of the sure increase in the demand at a rate more rapid than the population increase, there can be little question. What the iron business would seem to need most of all is some means of steadying the rate of production. The farmer when he plows and sows, and also when he reaps, has no individual customer in view. His crop is for no man, but for all men. The producer of pig iron, it would seem, might also depend more upon the general than upon the specific demand—more upon the sure and everlasting market than upon the market of the day or the year. It is an anomalous condition that the tenacity of life which iron possesses deranges rather than steadies the rate of production. If iron were as perishable as pumpkins or potatoes, we would probably have it supplied to us at a more uniform rate than now. The rates of demand and of supply would then at least have annual adjustment more accurate than now occurs in a decade.

TECUMSEH SWIFT.

About Drawing Curves.

Editor American Machinist:

There has been some discussion lately in the columns of the "American Machinist" about drawing curves, both connecting circles and irregular. Uniting circles to form irregular shapes can be accomplished on the drawing-board, so that the eye cannot detect any error, when the points desired are plotted out, but when it comes to reproducing the curves it is not so easy, and almost impossible if to be reproduced from any other than full-size drawings.

If Mr. Danse will go into the average pattern shop and reproduce these curves with the instruments that pattern makers have to use, and on a piece of wrapping paper or on a board planed off and chalked for the occasion, he will have a pretty hard job to connect short circles without doing some freehand work.

Now, instead of locating centers to strike these curves, which would have to be done, and is very difficult and confusing, as it takes two radii to locate each center, why not plot it out with ordinates? If this is not accurate enough, why not use the pantograph, which will reproduce curves or any shape from one scale to another as nearly correct as is possible with any instrument?

But I am afraid it is not practical to try to introduce such a machine in the pattern shop. The irregular curve of celluloid, rubber or wood has not been cut out by guess, and is used more or less by our best designers in every branch of machinery. It has its faults or defects the same as the circular arcs. It must be used on full-size drawings if to be reproduced. If the draftsman wants an irregular shape and lays it out to any other scale than full-size, and sends it to the pattern shop, he is likely to get a botch job; so let us compromise on these curves, and always send a full-size section to the pattern shop for irregular shapes. Then the pattern maker can lay a piece of thin paper or tracing cloth over the section wanted and transfer it to a templet or the pattern, always considering the shrinkage, which, however, does not amount to much on small sections.

On the other hand, if the drawing room and the pattern shop could adopt a standard irregular curve, such as favorite 27, there would be very little need of templets. I have known of one or two shops that have adopted this, but it cannot always be done, even in the drawing room, for, as a rule, where there are more than two or three draftsmen they all have different curves.

W. A. BRADLEY.

Oswego, N. Y.

Repairing the Crank Shaft.

Editor American Machinist:

Referring to the cut on page 1018, Mr. Emerson speaks in the text of putting the keys on opposite sides, "so that whatever offsetting effect one might have would be corrected by the other." Is it not a fact that the keys should be upon the same side in order to have the effect indicated, the offsetting then affecting the block *a* only?

ALBERT CONE.

[As to the offsetting effect of the keys, that would depend upon how the pieces were fitted, and probably as good and as correct results could be secured by either arrangement of the keys as by the other.—Ed.]

Punching or Shearing the Lugs of Tie-Plates.

Editor American Machinist:

I have followed with interest the series of articles upon dies and die construction that have appeared in the "American Machinist," and I submit the accompanying sketch and description of one which I was instrumental in designing, and which I think will interest others.

Fig. 4 is a view of a form of tie-plate now coming into use as a means of increasing the bearing area of rails and the rigidity of lateral connection to the ties. They are a rolled shape, and come from the rolling mills in lengths; spuds *b*, of course, running continuously throughout. They are cut off to the required length, and holes, not shown, are punched at one operation, and the dotted portions of the spuds are removed in a second operation, the punch for doing which is shown in Figs. 1, 2 and 3, and a description of which follows:

A is the punch block, shown in its highest position, and into it are fitted the upper knives *B*, separated by liners *C*, Fig. 2, and all held by set-screw *D*; the width *x* of the liners being the length of the spud which is left on the plate. The die-block *E* contains the lower knives *F*, which are held in fixed position laterally by being grooved into the upper knives, as shown in plan, Fig. 3, and are fastened to the die-block by bolts *G*, which are tapped into screw-plate *H*.

The tie-plate is shown in position in the front elevation, Fig. 1, and is held by backing plate *I* and adjustable stop *J* (see Fig. 3). The slots *K* allow the removal of the punchings.

In action the knives *B* descend, portion *p* shearing out the upper spuds and *q* the lower ones. Punchings made by *q* fall directly to slot *K*, while those made by *p* fall on the upper part of *q*, and are carried up by the return stroke, falling into slot *K*. When finished, the tie-plate is removed by sliding it out sidewise. The punch, as shown, is a double one, being designed for two operations.

The same operation on a similar tie-plate (before the design of this punch) was made in two strokes of a press; that is, one side of the punch shearing out either the upper or the lower spuds, and the opposite side of the punch shearing the other, the plate being first inserted in one side of the punch and then changed to the opposite side. The lower knives were horizontal steel plates, which I understand were difficult to hold in place. The sketches are made from memory, and show the principle only, no attempt being made to show planing strips and means to facilitate construction.

W. M. WICKHAM.

Pittsburgh, Pa.

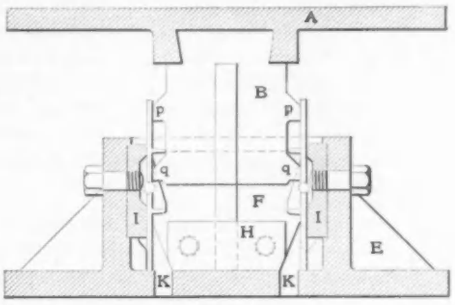


Fig. 1

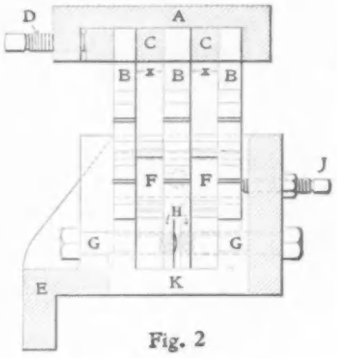


Fig. 2

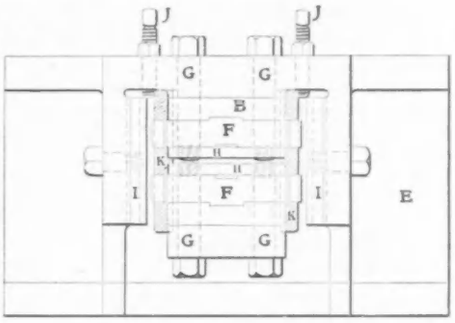


Fig. 3

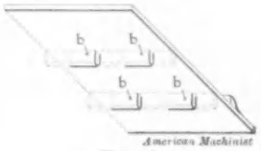


Fig. 4

FIXTURE FOR PUNCHING TIE-PLATES.

Cheap and Quick Repairs.

Editor American Machinist:

The articles appearing in the "American Machinist" of recent dates in regard to repairing broken crank-shafts have been particularly interesting to those who have to meet like emergencies. The suggestions made by Mr. Emerson in particular have called forth favorable comment in shop discussion.

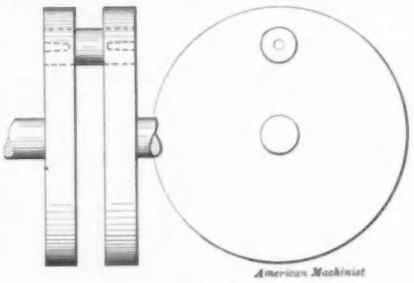


Fig. 1

TIGHTENING THE CRANK-PIN.

In Fig. 1 is shown a method used in tightening the crank-pin in a center-crank engine which had become loose in the disks. The correct thing to have done would have been to rebore the disks and put in a new pin; but as it was wanted "yesterday," and wanted for little or less (conditions frequent enough in a jobbing and repair shop), the following plan was carried out: Into each end of the crank-pin was drilled a 1-inch hole and reamed about one-hundredth of an inch taper to the inch. Then two tool-steel taper pins were turned to fit these holes, the shaft was put in the lathe and made to run true, the pins started in the holes, then the crank was put on an anvil resting on one of the pins, and the pins were driven home with a sledge, the crank put back in the lathe, and a light cut taken over pin and journals. This was inexpensive and satisfactory in every respect, and to us at least it was entirely new.

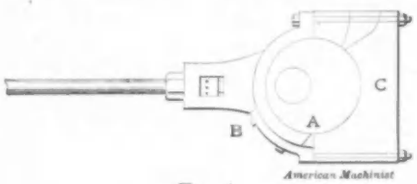


Fig. 1

A WOODEN ECCENTRIC-STRAP.

We have all used wooden flanges and white-pine plugs in cases of necessity, and I have heard of running hickory cross-head shoes or wedges, and of a man in the Michigan woods who used a convenient stump for the outer bearing for his crank-shaft; but it is only recently that I have

seen a wooden eccentric strap used, and that on a high-speed engine. It, of course, was only a temporary arrangement, put on until one could arrive from the factory; but it was doing its work in a manner entirely satisfactory.

B, Fig. 2, is a wrought-iron strap fastened to the eccentric strap to bolt the hardwood block *C* to, as the ear or boss on the strap had been broken off at *A*.

S.

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(96) M. M., Cincinnati, Ohio, asks: Does applying the brake on a wheel that has a hot journal increase the liability of the journal's breaking or twisting off? A.—The application of the brake puts an additional strain upon the wheel, and therefore also upon the journal.

(97) H. J. W. asks: Can you state in decimals of an inch the thickness of the different grades of tin, such as IC, etc.? A.—The only information we have been able to obtain is from a small book issued by Dickerson, Van Dusen & Co., of New York. In this book the thicknesses of the various grades are given in gage numbers, which we translate into decimals in the following table:

	Inch.		Inch.
IC	.015	DC	.016
IX	.017	DX	.018
IXX	.018	DXX	.023
IXXX	.020	DXXX	.026
IXXXX	.024	DXXXX	.029

(98) J. C. K., Jersey City, asks: Which is the best solution or oil to use in drilling nickel steel rod with a 3-32 drill, the hole being about 4½ inches deep? A.—We cannot find that anyone has had much experience in drilling such a hole as this in nickel steel. We should be inclined to think that as good success would be obtained with lard oil as with anything else, though a very good solution for drilling is as follows: Sal soda, ½ pound; lard oil, ½ pint; old-fashioned soft soap, ½ pint. Add water to make ten quarts, and boil one-half hour.

(99) J. C., Bradford, Pa., writes: A vessel having an elliptical base is filled with water. The area of the upper surface of the water is 47 square inches, and the long and the short diameters of the base are 13½ and 9 inches respectively. If a pressure of 12 pounds per square inch is applied to the upper surface of the water, its depth being 20 inches, what is the upward pressure? A.—It is not clear what this question aims to ask. The resistance or pressure of the water upward at its surface will, of course, equal the downward pressure applied to it, and neither the shape or size of the vessel, the depth of the water or the area of surface exposed to the pressure will have anything to do with it. If from anywhere below the surface of the water a pipe is led outward and upward then with 12 pounds pressure upon the surface within, 12 pounds pressure would also be required at the same level in the pipe outside to restrain the water from rising, or, as a column of water 1 inch square and 2.31 feet high weighs 1 pound, $2.31 \times 12 = 27.72$ feet would be the head required in the pipe above the level of the water in the vessel to resist the 12 pounds pressure upon it within.

(100) F. K., Cambridge, Mass., writes: A main shaft in a shop has been lined up as nearly as possible with the crank shaft of the engine. The driving belt runs in the center of the flywheel, but it runs to one side on the driven pulley. The supports are so close to the driven pulley that it cannot be moved on the shaft far enough to make the belt keep in the middle of it. The pulley is 2 inches wider than the belt. Now what is the fault, if the shafts are parallel? If not parallel, how should the main shaft be moved to make the belt run in the center of the pulley? Does a belt always climb to the high side? A.—In cases of this kind the belt crowds toward the ends of the shafts which are the nearer to each other, as has been many times explained in our columns, and to make the belt crowd the other way the other ends of the shafts should be brought nearer together by moving one or the other. If the shafts are absolutely parallel it is still possible for the belt to crowd to one side or the other if both halves of the pulley are not alike. Also, if one edge of the belt has stretched more than the other this would tend to run the belt to one side, and it might be corrected by changing the belt to run the other way.

(101) F. D. H., Brooklyn, asks: What would be the relative merits as regards durability, friction, etc., of two babbitted bearings, alike as to quality of metal, pressure per square inch, lubrication, etc., but one having the metal hammered in and bored, while the other is poured round a mandrel and scraped to a bearing with the shaft? Is there any rule for thickness of babbitt? What is good practice for medium-size high-speed engine shafts? A.—We doubt if anyone knows just what the relative wearing qualities would be under the conditions you name, and it is doubtful if it can be ascertained so as to be stated in general terms to cover all cases. The conditions regarding pressure, lubrication, etc., might, for instance, be such as to make any unpounded box wear out almost immediately, whereas the conditions would lack just enough of being too severe for the pounded box to enable it to give fairly satisfactory service, whereas in another case either kind of bearing might answer fairly well. Perhaps, however, some of our readers may have had opportunities of comparing such journals under conditions that will enable them to make something like accurate comparisons. If so, we should be glad to hear from them. We know of no rule for thickness of babbitt. The best practice is to pour, pound (or roll), bore and scrape the babbitt on such work as you mention, but it is by no means always done.

Electrical Engineering at the University of Illinois.

The great development of the electrical industries and the resulting tendency toward specialization has led Professor Aldrich to arrange the work of the University of Illinois accordingly. At the end of the first two and a half years of his work the student is offered three electives, namely, the regular electrical, the electro-physical and the electro-chemical courses. Great attention is paid to alternate current, polyphase and metallurgical work. The degree of electrical engineer is only given after five years' work.

Technical Publications.

"La Locomotiva." By Michele Ferrero. Published by S. Lattes & Co., 3 Via Garibaldi (Piazza Castello), Torino, Italy.

This is a description of the construction and functions of a Brooks locomotive. Throughout the text are numerous diagrams, and at the back a number of colored plates of portions and different sections of the locomotive, so superposed and folded together as to enable the student to commence at the outside and penetrate to the inner portions of the mechanism, readily perceiving the relative positions of all the parts and the duties which they perform.

"Jim Skeevers' Object Lessons on Railroading for Railroaders." By John A. Hill. 157 3½x10-inch pages. The American Machinist Press. Price $1.

These "object lessons" are reprinted from the pages of "Locomotive Engineering," to the readers of which journal they bear much the same relation that Chordal's letters do to the readers of the "American Machinist." The railroad atmosphere hangs thick about the book—one can almost smell the oil and hear the exhaust—and the humor is irresistible. While written for railroad men, no mechanic can read how Jim enforced his object lessons without keen enjoyment. We will match the story of how he took the "Fourth Vice" on a trip to show how his own rules on firing to prevent smoke should be carried out—with the result of a stalled train and most of the other trains delayed in consequence—against all comers for genuine wit and sound sense.

"The Use of the Slide Rule." By F. A. Halsey. 84 3¼x6-inch pages with 19 illustrations. Van Nostrand's Science Series, No. 114. D. Van Nostrand Company. Price 50 cents.

This volume is, to a large extent, a reprint of the articles which appeared in our columns during 1896. Chapters have, however, been added on Slide Rule Formulas, Gage Points, The Inverted Slide, Circular Slide Rules, Extended Scale Instruments, and the Cox Computers. As stated in the preface, it is intended as an instruction book and not as a treatise, and this distinction has been observed throughout. A special feature is the illustrations, eleven of which are full-sized wax-process engravings from an actual slide rule, set for the solution of the problems given in the text, and not, as usual, mere diagrams showing the principle only, and having no resemblance to the actual instrument. The book is also unusual in that the author does not allow his admiration for the instrument to lead him to give endorsement to the numerous fads which abound in most books on the subject. On the contrary, the reader is warned against them, and has the limitations of the instrument in practical use pointed out to him.

Personal.

F. G. Kretschmer, who was formerly the New York representative of the Brown & Sharpe Manufacturing Company, is now with Gustav Diechmann & Son, of Berlin.

Y. R. Tucker, formerly with the Brown & Sharpe Manufacturing Company, has organized a company to manufacture universal grinding machines in Providence, R. I. The new concern will be known as the Universal Machine Company.

Obituary.

James W. Pennypacker, for many years foreman of the car shops of the Pennsylvania Railroad at West Philadelphia, died at St. Petersburg, Fla., November 20, sixty years old. Ill health had compelled his retirement.

Thomas W. Bracher, an inventor of various machines and devices in the hat industry, died in this city November 20, fifty-six years old. He was born in Ohio and was educated in the public schools of this city. He had obtained thirty patents and had established factories in the hat-making centers of England. The operation of stitching leather sweat bands into hats, which is done by a machine of his invention, is known to the trade as "Brachering."

The November 21 issue of the United States Patent Office "Gazette" is of unusually large size. The total number of patents issued for the week is 535. Of this number fifty-five are in the name of a single inventor for an improved printing press and system of printing. These patents contain 1,593 long claims, which, with the illustrations, occupy 132 pages.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant ; see p. 16.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Rawhide, fibre and hard rubber gears. The Arthur Co. (See page 8.)

Construction and repair of Commutators, 50c. L. C. Sharp, Omaha, Neb.

Light and fine mach'y to order ; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Parallel attachments for drawing board or table, $1.50. F. G. Hobart, Beloit, Wis. ; cir'lrs.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

For Sale—Two geared Ferracute presses, 62 in. between uprights ; little used, and in good condition. Address W. H. Mullins, Salem, Ohio.

Threads and gears ; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. by G. W. Dixon, Spring Lake, Mich.

For sale at cost, 50 cents, few more copies of National Railroad Master Blacksmith Association "Proceedings" of September 5, 6, 7, 1899. A. L. Woodworth, secretary, Lima, O.

Wanted—A second-hand steam or air hammer that will handle about 4 in. shafting ; suitable for mine repair shop ; give full information, with illustration and price. Address "Mining," AMERICAN MACHINIST.

For Sale—One 20 horse-power horizontal tubular boiler, with pumps, inspirator, heaters, etc., and one Armington & Simms, 50 horse-power engine ; all in first-class condition. Inquire Box 407, AMER. MACHINIST.

Wanted—Partner with capital, mental comprehension and strict integrity, to engage in manufacuring machinery ; rare opportunity ; cheapest fuel in the world ; building site free ; sure sale for products. Address Box 24, AMERICAN MACHINIST.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Manufacturers intending to introduce practical patented novelties of every description on the European market are requested to communicate with Adolf Heerdt, 15 Schillerstrasse, Frankfort-on-Maine, Germany, importer and general merchant. A1 references given and wanted.

A well-equipped machine shop and foundry, with ample water power, capacity 50 mechanics, tools suitable for engine building up to 24 x 24-inch or similar work, invites proposals in their line, or will consider manufacturing new specialties. Address P. O. Drawer 414, Lockport, N. Y.

Experienced engineer, well connected throughout Great Britain and the continent, desires agencies for good American machinery of all kinds ; has exceptional facilities for selling patents or arranging for manufacture under royalties ; British and American references. Address Brown & Co., 49 Deansgate, Manchester, England.

An excellent chance for someone with a few thousand dollars to step into a modern machinery manufacturing plant, about one hour from New York city, that is making money ; employing about 50 men ; will be sold free of incumbrances and on easy terms ; the owner wishing to retire on account of ill health. Address Box 420, AMER. MACHINIST.

An up-to-date, hustling firm building machine tools have outgrown their present quarters ; this business has been in operation 14 years, and has a healthy growth ; we thoroughly understand this business and wish to form a combination with parties owning a modern plant that wish to be relieved of the cares of the details in the management of the business. Address Box 23, AMER. MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded ; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Tool dresser and machine forger. Lock Box 28, Lakeport, N. H.

Experienced man on Brown & Sharpe, Stehlle, Spencer and Hartford automatic screw machines. Box 28, AMERICAN MACHINIST.

General foreman or superintendent of machine shop, age 39 ; first-class references ; accurate, heavy work. Box 27, AMER. MACH.

Machinist wants position, shop testing and installing steam engines ; can furnish best of reference. Address Box 19, AMER. MACHINIST.

Foreman machinist wishes position, New York district ; 12 years' experience, machine tool, high-speed marine engines, tool and die making ; $24 a week. Box 25, AM. MACH.

A thorough, practical machinist, 31, wants position as foreman ; experience steam engine, electrical and general machine-shop work. Address Box 18, AMERICAN MACHINIST.

A thoroughly reliable machinist at present constructing engineer, desires position as foreman, superintendent or any responsible position ; 21 years' experience ; will go anywhere. Box 39, AMERICAN MACHINIST.

Foreman, by toolmaker of wide experience, on sheet-metal goods and general manufacturing ; can design dies and fixtures to reduce cost ; New York or Philadelphia vicinity. Box 34, AMERICAN MACHINIST.

As superintendent or chief draftsman ; competent man with wide experience on gas engines, printing and miscellaneous machinery ; is thoroughly capable and practical. Address Box 33, AMERICAN MACHINIST.

Mechanical engineer, technical graduate and 18 years' experience in hydraulic, steam and general machinery, wants position as assistant superintendent or chief draftsman ; first-class designer. Box 36, AMER. MACH.

Now superintendent of shop manufacturing high-grade interchangeable machines of great variety ; wish change climate ; good education and references ; thorough mechanic ; well up in electrical work. Address Box 12, A. MACH.

Mechanical engineer, several years' experience in modern factory construction and designing special machinery for same, wishes position with manufacturing establishment intending to enlarge or re-equip. Box 38, AMERICAN MACHINIST.

Skilled toolmaker and draftsman wants work ; experimental work a specialty ; 16 years' experience drafting, toolmaking and building experimental machinery for gun, sewing machine and machine tool companies. Box 37, AMERICAN MACHINIST.

Mechanical engineer, familiar with hydraulic engineering, general machinery and water-wheel construction, is open for engagement January 1 ; invites correspondence from water-wheel builders wanting to improve upon the efficiency of their wheels. Box 35, AMERICAN MACHINIST.

An efficient mechanic with broad experience in manufacturing, building machinery, designing and making tools for manufacturing duplicate work commercially and up to date, will be open December 1 for position as foreman or superintendent ; good systematizer and manager ; A1 references. Box 26, AM. MACH.

Help Wanted.

Draftsman—Wanted, first-class man on electric cranes. Address Box 20, AM. MACH.

Wanted, at Once—Three capable men for general machine work. Greenwood Bros. & Co., So. Gardner, Mass.

Machinists wanted ; regular work and good pay to competent men. Watertown Engine Co., Watertown, N. Y.

Wanted—Experienced sealer and adjuster weighing scales ; state positions held and wages. Address "Scale," AMER. MACHINIST.

Draftsman wanted who can design hydraulic valves ; state age, experience and salary expected. Brandywine Machine Works, Wilmington, Del.

Wanted—Up-to-date machinist to take

(*Continued on page* 38.)

New Catalogs.

Baker & Co., Newark, N. J., have issued a pamphlet entitled "Sparking Points," which refers to a particular alloy which it is claimed has superior merit as a sparking point for use in the operation of internal-combustion motors. The pamphlet is 3¼x5¾ inches.

Henry Pels & Co., 66-68 Broad street, New York, send us booklet in which are described and illustrated portable cutting and punching machines to be used in structural iron and steel work. The booklet contains sectional cuts of the machines and ought to interest those who have to do with work of the class referred to. It is standard size, 3½x6 inches.

E. A. Rix, San Francisco, Cal., sends us pamphlet entitled "Some Recent Compressed-Air Machinery." This pamphlet contains fully illustrated descriptions of compressed-air machinery designed by Mr. Rix. The articles are reprinted from various technical journals, both American and foreign, and to those interested in the installation and maintenance of this class of machinery the pamphlet should be of interest. It is 7½x11 inches.

We have received from the Detrick & Harvey Machine Company, Baltimore, a copy of a new catalog describing and illustrating their line of open side planers. Some interesting facts concerning this type of planer are given, including an account of their construction and method of operation. The catalog contains a number of interesting illustrations showing the adaptability of the open side planer to various classes of work. The catalog is standard size, 6x9 inches.

Manufacturers.

G. A. Crosby & Co., 176 South Clinton street, Chicago, are building a new factory in order to meet the demands of increased trade.

Plans have been prepared for an addition to the works of the Shannon Manufacturing Company, Eleventh street and Washington avenue, Philadelphia, Pa.

The capacity of the Bowden felting works, Millbury, Mass., is to be doubled by the addition of new machinery at once, and the next season the plant is to be enlarged.

The capacity of the Macbeth-Evans Glass Works at Charleroi, Pa., will be doubled. The ground has been staked off and excavation begun. Two large tanks will be built.

The Hercules Steel Casting Company, whose plant is located at Harvey, Ill., and who are to engage in the manufacture of steel castings by a new process, has lately been incorporated.

Architect W. W. Bretherick, of Lancaster, Pa., has recently finished drawings for a modern factory building for Messrs. Stehman & Stehman, of that city. It will be brick and iron, costing about $9,000.

There is some prospect that Warsaw, N. Y., will have a jewelry manufactory. A firm from Pawtucket, R. I., have been looking over the ground and are favorably impressed with Warsaw as a site for a factory.

The Nichol Wheel Scraper Company, of Independence, Mo., recently bought 75 feet of ground on Broadway, Kansas City, Mo., just south of Twenty-fourth street, and will begin the erection of a two-story building at once.

The Holmesburg Banding Manufacturing Company, of Holmesburg, Pa., will have an addition made to their plant, which will be one story and basement, measuring 24x300 feet, of frame construction. Owners will install special machinery.

It is probable that the plant of the Eagle

(*Continued on page* 39.)

Help Wanted—Continued.

charge of machine plant; must invest in company's stock; references required. Box 31, AMERICAN MACHINIST.

Wanted—General manager for foundry employing about 75 molders; must be experienced and up-to-date man. Address Box 415, AMERICAN MACHINIST.

Machinists wanted; a number of first-class men on high-speed marine engine work. Apply Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, New York City.

Wanted—A first-class foreman machine blacksmith, to take charge of forging department in large machine shop; state age, wages, nationality, experience and references. Box 419, AMERICAN MACHINIST.

Wanted—First-class toolmaker, experienced on jigs and fixtures for sewing machines, typewriters, or a similar class of work; good wages to the right man. National Typewriter Co., 23d and Arch sts., Philadelphia, Pa.

Wanted—One first-class molder, with experience in green-sand, dry-sand and loam molding, as leader in foundry working 10 to 15 men. State age, experience and wages expected to Box 32, AMERICAN MACHINIST.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from draftsmen, pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—One or two bright young men, to buy established machine shop in New York, doing good business; is fitted up with best of modern tools, and we will send to party buying, all our trade in this line; an exceptional chance for the right party to start in business, and terms will be made satisfactory to purchaser; price low. Address O. G. N., Box 30, AMERICAN MACHINIST.

A well-known electrical manufacturing concern, manufacturing complete direct-current electrical equipments, is desirous of obtaining the services of an electrical and mechanical engineer, who must be thoroughly familiar with the design and manufacture of all kinds of direct-current apparatus. Address, stating experience, salary expected, etc., Box 29, AMERICAN MACHINIST.

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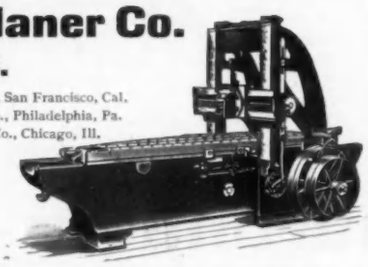
Pratt & Whitney Co., Chicago, Ill.

De Fries & Co., Dusseldorf and Berlin, Germany.
A. Janssens, Paris, France.
A. Janssens, Bruxelles, Belgium.
Burton, Griffiths & Co., London, Eng.
Sonessons & Co., Malmo, Sweden.



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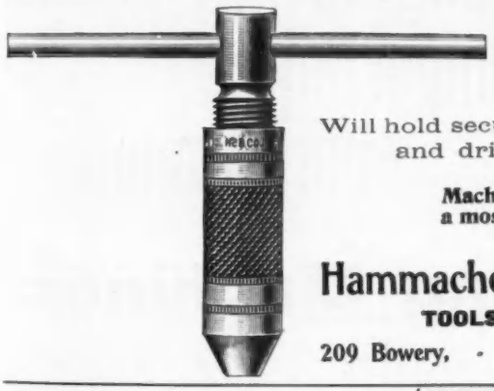
3. *Contains JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.*
4. *The Easiest Repaired, and all parts Interchangeable.*
5. *Every Valve Tested before leaving the factory.*
6. *cALL GENUINE stamped with Trade Mark.*

Jenkins Brothers, New York, Philadelphia, Chicago, Boston.



Adjustable Tap Wrench

Will hold securely, taps up to 1-4 inch and drills up to 3-16 inch.

Machinists will find this a most useful tool. . . . .

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Easier Accuracy

In the drafting room comes with the use of our Parallel Attachment for the drawing board, which effectively takes the place of the T-square and saves time that is worth saving. See illustrated description in American Machinist of September 21.

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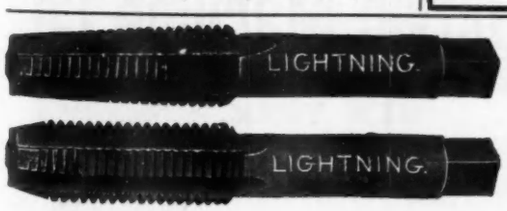

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Send for Catalog.

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Greenfield, Mass., U.S.A.
Agents in London, SELIG, SONNENTHAL & Co., 85 Queen Victoria Street.

(*Continued from page* 38.)

Manufacturing Company in Armourdale, Mo., will be largely increased during the next six months. The capital stock of this concern is now $100,000, and on December 19 a proposition will be voted on to increase this to $250,000.

William Lardner, of Deadwood, S. D., has sold to the Cascade Water Power & Electrical Transmission Company, fifteen miles of water rights on Spear Fish Creek; consideration $100,000. The Cascade Company proposes to put in an electric plant to furnish electric power and light for the Black Hills.

Robert H. Foerderer, Philadelphia, Pa., intends starting a glue factory at the old Bridesburg Manufacturing Company's building. It will have all the latest improved machinery for that purpose. He also contemplates building a row of houses on Frankford avenue, from Vici street to Wheatsheaf lane.

The Grand Rapids (Mich.) Malleable Iron Company secured a permit from the building inspector recently for the construction of its buildings on Alpine avenue near the D., G. H. & M. junction. The permit calls for the construction of a building one story high, and to be composed of brick. It will be 200 feet wide and 700 feet long, and will cost $35,000.

A one-story foundry building will be erected at Bangor, Pa., for the S. Florey Manufacturing Company, of that place, and owners will equip same with most approved power apparatus and special heavy machinery. Plans are private, but call for a building of brick and iron frame measuring 50x116 feet, with slag roofing, electric wiring, plumbing and drainage, etc.

Rush J. Whiteside & Sons are making alterations and repairs to Lever Brothers' soap factory, on Wood street, west of Twenty-third, Philadelphia, Pa., at a cost of $10,000. The work includes raising the roof of one building, 35 by 60 feet; building interior brick walls, laying two new floors on steel beams, two elevators, new cement floors and general alterations.

The Baker Forge Company will shortly be recognized as the Steel Car Forge Company, with a capital of $200,000. The Baker Company is now operating works at Ellwood, Pa. The Steel Car Forge Company will maintain its Ellwood plant, and will enlarge and extend it within the line of railroad forgings. Henry R. Rea, at present the head of the Baker Company, will be president and treasurer, and James H. Frazer will be secretary of the new corporation.

Over $150,000 is to be spent at the plant of the Somerset Fiber Company, Fairfield, Me., in making alterations and additions. Six buildings which will cover 25,000 feet of ground are to be erected, and to furnish power for the new mills a canal 60 feet wide and 400 feet long is to be built on the easterly side of the island, starting at the point near where the mill now stands. The wheels will be at the lower end of the dam. This work will be commenced at once and 100 men will be employed to do the work. Over $40,000 will be expended.

Mr. Z. R. Tucker, for a number of years employed as draftsman and designer with the Brown & Sharpe Manufacturing Company, and lately associated with the Diamond Machine Company, has purchased the drawings, patterns and special tools, together with parts of machines in process for the manufacture of the universal grinding machines formerly manufactured by the Diamond Machine Company, and has fitted up a shop and organized a company for continuing the manufacture of of the same. The new company, known as the Universal Machine Company, will be located in Providence, R. I.

Is The "Deadly Parallel" Too Old To Work?

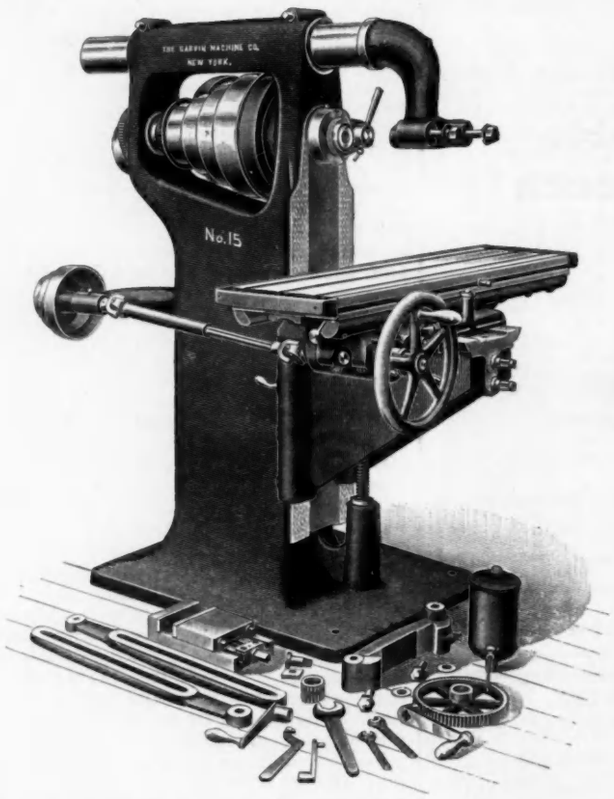
A large manufacturing concern recently purchased a few Carborundum wheels; and, unknown to us, made a series of careful tests between them and the Emery wheels which it was regularly using. These tests resulted in so favorable a showing for the Carborundum wheels, that the concern in question furnished us with its record of the trials. We give below a summary of one of these competitions:

	Emery Wheel.	Carborundum Wheel.
Size of wheels,	24 in. x 3 in.	24 in. x 3 in.
Number of hours operated	128	160
Diameter of wheels at end of test,	20¼ in.	22½ in.
Cubic inches of wheels worn away,	391.0	164.4
Ditto, on basis of 160 hours for each,	488.7	164.4
Relative durability of wheels,	1.0	2.06
Price paid for each wheel,	$16.15	$29.75
Value of wheels, based on durability,	$16.15	$47.80
Working qualities,	Burns Castings. Had to true and pick often.	Does not burn. Not necessary to dress during trial. Cuts faster than Emery wheel.

This one Carborundum wheel saved its users $18.05 through its greater durability alone. In addition to this, the Carborundum wheel did faster work, and did not require dressing. This means a saving of labor. Then the Carborundum wheel did not burn the work; while the Emery wheel did. This test exactly illustrates our claim that Carborundum, by doing MORE WORK, FASTER WORK AND BETTER WORK. IS THE CHEAPEST ABRASIVE IN THE WORLD.

The Carborundum Company,

NIAGARA FALLS, N. Y.



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